HEALTH ASPECTS OF PESTICIDES

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ENVIRONMENTAL PROTECTION AGENCY

ENVIRONMENTAL PROTECTION AGENCY
PESTICIDES PROGRAMS

DIVISION OF PESTICIDE COMMUNITY STUDIES

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HEALTH ASPECTS OF PESTICIDES ABSTRACT BULLETIN is a monthly publication of the Division of Pesticide Community Studies of the Environmental Protection Agency.

The purpose of this publication is to foster current awareness of the major worldwide literature pertaining to the effects of pesticides on humans. The publication represents a monthly review of more than 500 domestic and foreign journals. Subjects and authors of abstracted articles are cross-referenced in an annual index issue. Reprint requests should be directed to the author of the complete article.

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CONTENTS

Vol. 5 January 1972 No. 1

Page

General 1

Monitoring and Residues 6

Epidemiology, Prevention and Treatment 18

Toxicology and Pharmacology 23

Analysis 43

ERRATUM

Replace column 1, page 630, November issue with the following:

chloride. The girl died on the fifth day of respiratory and cardiac arrest. The pathologicoanatomic diagnosis included: dystrophic parenchymatous changes, bilateral bronchitis, bilateral pleural pneumonia, swelling of the brain, venous plethora of the internal organs, etc. This case illustrates the need for measures in chlorophos poisoning to restore the acid-base equilibrium, to correct respiratory acidosis by artificial respiration and, in the presence of pronounced seizures, to employ agents such as hexenal to depress the respiratory center.

71-2421. Smusin, IA. S.; Khudiakov, G. N. (Dept. of Forensic Medicine, I. P. Pavlov I Leningrad Medical Inst., Leningrad, USSR). **K voprosy o lechenii otravlenii khlorofosom. [The treatment of chlorophos poisonings.]** *Ter. Arkh. 42(1): 105-8; 1970.* (9 references) (Russian)

The therapy of chlorophos (trichlorfon; O,O-dimethyl-1-oxy-2,2,2-trichloroethane phosphonate) poisoning is described and illustrated by a brief case history. When the poison is orally ingested, a rapid and copious gastric lavage with a suspension of activated charcoal is necessary. On the appearance of systemic poisoning symptoms, the rapid administration is required of atropine sulfate in doses that significantly exceed those intended for other purposes (in severe poisonings on the first day, this can mean up to 24 to 28 mg atropine) but in such cases, it is also necessary to administer prophylactically substances that stimulate cardiac and respiratory activities and antispasmodics. The use of cholinolytic agents (pentafen, tropacine, Diparcol, etc.) is recommended. A good effect can be obtained by administering cholinesterase reactivators in combination with cholinolytics. In an emergency, extensive use should be made of oxygen, artificial respiration, lobeline, histaminolytic agents, glucose, noradrenaline, cortisone, etc. The administration of morphine, barbiturates and tranquilizers is contraindicated. (Author abstract translated and modified)

71-2422. Smith, D. A.; Wiseman, J. S. (Duke U. Medical Center, Box 3387, Durham, NC 27706). **Pesticide poisoning: Epidemiology of pesticide poisoning in the Lower Rio Grande Valley in 1969.** *Texas Med. 67(2): 56-9; 1971.* (5 references)

Documented cases of pesticide poisoning in Cameron and Hidalgo Counties, Texas, dropped from 118 in 1968 to 15 in 1969. Of these, 15 cases (87%) were related to occupation. The greatest number of cases (five, involving carbaryl) was reported among formulators of pesticides. From 1968 to 1969, cases among aerial applicators dropped from 73 to two and among growers and farmworkers, from 33 to three. Of the 33 cases in 1968, 23 occurred in a mass poisoning in one field. Two-thirds of the poisonings in 1969 occurred in June during the peak formulation of pesticides and the first aerial applications of the season. Pesticide applications decreased about 45% from 1968 to 1969 because of the increased use of

72-0001. Allen, M. G.; Stovvel, F. R. (Shellstar Ltd., Ince, Chester, England). **Herbicides as an aid to conservation and amenity.** *Proc. Brit. Weed Contr. Conf. 10th 3: 1063-70; 1970.*

The use of herbicides, in particular 2,4,5-T and 2,4-D, by municipal parks departments and local authorities is surveyed from the practice in the United Kingdom. The justification for herbicide usage is reviewed from the points of view of the labor involved, time, costs, appearance and safety as well as of the type of herbicide available and in current use. Specialized uses in agriculture include scrub control, rabbit clearance, and the reclaiming of grazing land. In forestry, herbicides are employed for nonselective preplanting sequence and selective postplanting treatments for conifer release. The use of herbicides for weed control during the establishment of plantations is justified in term of economic labor and in terms of the duration of the control required.

72-0002. Made, L. W. (Cela Landwirtschaftliche Chemikalien GmbH., Ingelheim, Germany). **Herbicides and conservation in the Federal Republic of Germany.** *Proc. Brit. Weed Contr. Conf. 10th 3: 1079-88; 1970.* (17 references)

The use of herbicides in West Germany between 1965 and 1970 is discussed in the light of the tonnage of active substance (without DNOC). Figures on hunted animals (red deer, roe deer, wild pig, hare, rabbit, pheasant, partridge, and wood pigeon) are shown for the same period. In the case of these animals, no harmful influence has been ascertained. The only exception, however, is the partridge, for which a detrimental influence has been noticed, in the form of a decreasing population. Chemical weed control in and along waterways is discussed in connection with its direct and indirect effects on fish. (Author abstract)

72-0003. Arnan, A. (Curative Ser. Div., Min. of Health, Jerusalem, Israel). **Experience in the WHO field programme for evaluating the safety of new insecticides.** *Bull. World Health Organ. 44(1-3): 273-6; 1971.* (5 references)

After careful laboratory evaluation, every new insecticide is subjected to village-scale trials, under the WHO Scheme for Evaluating and Testing New Insecticides, before it can be recommended for general use. Several such trials have been conducted to obtain both entomological and toxicological information. The toxicological assessment includes both clinical observations and laboratory tests on both spraymen and residents. Laboratory tests should be of a kind suitable for field operations. So far, only serum cholinesterase determinations have proved suitable: determinations are usually made before spraying, immediately after spraying and again a few weeks later. The final evaluation of the safety of a new insecticide must always take into account the conditions under which it is likely to be used: it must be remembered that it will be used in confined spaces, that it may contaminate bedding and food, that safety precautions by the spraymen will be negligible and that the general supervision will be inadequate. (Author abstract)

72-0004. Bruce-Chwatt, L. J. (London School of Hygiene and Tropical Medicine, London, England). **Insecticides and the control of vector-borne diseases.** *Bull. World Health Organ. 44(1-3): 419-24; 1971.*

The future of pesticides in public health programs and agriculture is discussed with particular reference to developing countries. Increasing insect resistance to pesticides and public pressure to ban their use for ecological reasons are viewed as likely developments. Over 100 species of disease-carrying arthropods and 250 species of agricultural pests have become resistant to insecticides. Although DDT is not completely free of this defect, it is not as problematic as other insecticides. The world is faced with the danger of running out of compounds that are acceptable to all and alternative approaches to large-scale pest control have yet to be developed. At the same time, pressure is being brought to ban such compounds as DDT, which has a proven record of effectiveness and safety. Pollution by pesticides is a serious problem that may well have long-term adverse effects. But it is obvious that the advantages outweigh the potential hazards when the alternative to pesticide use is starvation and disease, as is the case in developing countries. The problem of pesticides is only a small part of the wider issue of environmental deterioration. Criteria must be developed by which the costs of reducing a given kind of pollutant can be assessed against the benefits that would be obtained. In the meantime, there should be no crash programs to ban DDT or other chemicals. The main danger of the present exploitation of the planet has not been fully appreciated by societies, international bodies and countries. It is the pressure of growing population and rising demands, which the earth support must longer. Man cannot succeed in meeting this challenge if he relies on unpredictable natural forces such as disease and starvation to maintain the balance. The struggle to control or eliminate endemic disease has reached a point of no return.

72-0005. Anonymous. **DDT nailed again.** *Nature 233(5318): 299-301; 1971.*

The advisory committee on DDT appointed by William D. Ruckelshaus, Administrator of the Environmental Protection Agency, has recommended phasing out all uses of DDT except for the 'control of disease-bearing insect vectors.' The committee stated that present use of DDT 'does not present an imminent hazard to human health, in terms of bodily functions and safety,' but that its continued use is 'an imminent hazard to human welfare in terms of maintaining healthy desirable flora and fauna in man's environment.' The committee expressed the belief that DDT levels in food are now in equilibrium with levels in the environment and that food levels will remain fairly constant for the next few years, even if no more DDT is used. Levels in human tissue will remain high for some time because equilibrium with the concentrations in food has not yet been reached. The committee concluded that 'the evidence to date clearly shows that DDT induces hepatomas and suggests it may be carcinogenic,' although studies of workers in DDT factories have shown 'no clinical or laboratory effects attributable to exposure to DDT.'

72-0006. Galston, A. W. (Dept. of Biology, Yale, U., New Haven, CT 06502). **Some implications of the widespread use of herbicides,** *BioScience 21(17): 891-2; 1971.* (6 references)

In consideration of the widespread use of herbicides, it is no longer sufficient to test compounds only for their immediate and direct toxic effects. Research must be extended to routinely cover their carcinogenicity, mutagenicity, teratogenicity and long-term environmental consequences. Herbicides are too important in the production of food to be abandoned, as some advocate. The task of research is to develop specific, effective chemicals that will not endanger man or his environment.

72-0007. Westing, A. H. (Dept. of Biology, Windham Col., Putney, VT 05346). **Ecological effects of military defoliation on the forests of South Vietnam.** *BioScience 21(17): 893-8; 1971.* (31 references)

The ecological impact of forest defoliation conducted by the U. S. military in South Vietnam is discussed. The data given are acknowledged to be rough, but conservative, estimates based on sketchy information. A full evaluation must await the release of detailed information on the areas sprayed, dates of application and agents used and a detailed study of the distribution of forest types and their ages and histories of exploitation. More than 4.9 million acres of forest have been sprayed with defoliants one or more times since 1961. The principal compounds used have been Agent Orange (50:50 mixture of the n-butyl esters of 2,4-D and 2,4,5-T) and Agent White (80:20 mixture of the triisopropanolamine salts of 2,4-D and picloram). Over 55 million lb of 2,4-D, over 47 million lb of 2,4,5-T and over 2 million lb of picloram have been applied. The data now available suggest that plant and animal communities have been significantly changed and that primary productivity has been reduced in 4.9 million acres of sprayed upland jungles. A decade or longer may be necessary for the full restoration of productivity. At least 20% of South Vietnam's 1.2 million acres of mangrove forest has been completely destroyed for a period that is perhaps measurable in decades. In this type of forest, the application of herbicides did not result in defoliation, but the outright killing of the entire plant community. For reasons that are not clear, the reestablishment of any new plants seems to be prevented for at least 6 years.

72-0008. Anonymous. **Public health: No threat from PCBs.** *Chem. Eng. News 49(41): 12; 1971.*

Spokesmen for the Federal Food and Drug Administration (FDA) have announced that polychlorinated biphenyls (PCBs) pose no imminent threat to the safety of food or to the public health. The FDA knows of no food that is consistently contaminanted with PCBs. Except for isolated incidents involving fish, almost all high levels of PCBs found in food to date have been associated with accidents, which the FDA is working to prevent. Surveillance of the food supply has been stepped up and a coordinated government effect to deal with PCBs has been instituted. Temporary dietary intake of 150 to 300 mcg of PCBs/day is considered safe.

72-0009. Kiesling, R. L.; Lloyd, Jr., E. H. (Author address not given). **Fungicide uses and problems in North Dakota.** *North Dakota Farm Res. 24(4): 29-31; 1971.* (5 references)

Fungicides are chiefly used as seed treatments and foliar protectants. The chief seed fungicides are captan, maneb plus zinc ion complex, maneb and carboxin, which are used on hard red spring wheat, durum, barley and potatoes. Foliar fungicides–mostly dithiocarbamate and fixed copper types–are applied to wheat, durum, barley, potatoes and sugar beets. About 160,000 acres is sprayed with fungicides. The State Cooperative Extension Service has an ongoing educational program in the proper use of fungicides. Printed material, classes, workshops, television and radio have been used to reach fungicide users. Even so, recent cases of mercury-treated seed being fed to hogs and poultry are on record.

72-0010. Simmonds, F. J. (Commonwealth Inst. of Biological Control, Trinidad, West Indies). **Biocontrol–the alternative pesticide.** *Your Environment 2(2): 61-3; 1971.*

Several completely successful instances of large-scale pest control with natural predators are described to illustrate the feasibility and advantages of biological methods. Many attempts at biological control of pests have failed, but, the author contends, some failures could have been prevented by adequately financed research. Governments and other bodies loudly profess their concern about environment pollution and pay a great deal if lip-service to finding alternatives to chemical pesticides. Adequate financing for the necessary research to do so has not been forthcoming.

72-0011. Salcedo, R. N. (Office of Agricultural Communications, U. of Illinois, Urbana, IL 61807). **Comprehension of pesticide label terminology: Another stab.** *Agr. Chem. 26(8): 20-1; 1971.*

In research at the University of Illinois, rural and urban pesticide users (actual or potential) were given a forced-answer, multiple-choice comprehensive test on 50 terms taken from pesticide container labels. The test results showed that farmers and city dwellers did not differ significantly in their comprehensive of pesticide terminology. 'Germs' and 'herbicides' were the most trouble-some items for city respondents. 'Controls,' 'infestation,' 'inhalation of mist,' 'fungicide,' 'systemic insecticide' and 'deodorant' occupied a position of being neither difficult nor easy. Farmers found 'germs,' 'controls' and 'fungicide' troublesome. 'Systemic insecticide' and 'deodorant' were neither easy nor difficult. All other terms were easily comprehended. Overall, the test scores were high. In respect of pesticide safety, the problem does not seem to be the user's understanding of instructions, but rather one of getting the user to read the label in the first place.

72-0012. Anonymous. **Hazards to man from pesticides.** *World Health Organ. Chron. 25(8): 378-9; 1971.*

In a 2-month survey conducted by the World Health Organization (WHO) in Indonesia in 1969, unusually frequent acute pesticide poisoning was found among the general popula-

tion and agricultural workers. As a result, recommendations concerning the safe use of pesticides were made to the Government. WHO supplied tintometers and trained a staff to monitor cholinesterase levels in the field. The effects of chronic exposure to pesticides in Indonesia are being investigated.

72-0013. Anonymous. **DDT may be good for people.** *Nature 233(5320): 437-8; 1971.*

In this editorial, scientists are urged to insist that the present public discussion about DDT and other pesticides be conducted with a better sense of proportion than in the past. If the present controversy were to end in a total ban on DDT, more harm than good would be done to public welfare. The entire case against DDT now rests on damage to species other than man. While this damage is important regrettable, it is not disastrous. In the United States, the harm done to wildlife is attributable to the extravagant use of DDT in the late fifties and early sixties. While questions about the effects of DDT do need to be answered, there is enough evidence at the present time to suggest that the proper legislative course is not be ban DDT, but to insure its proper use.

72-0014. Jukes, T. H. (Berkeley, CA 94704). **DDT all the way to the sky.** *Chem. Eng. News 49(43): 6; 1971.*

In a letter-to-the-editor, the author calls the statement that 'as much as 25% of all DDT compounds produced to date may have been transferred to the sea' a nonfact that has now 'entered the mythology.' The statement was quoted in this journal, *49(32):16-8; 1971* (for an abstract see 71-2592), from 'chlorinated hydorcarbons in the marine environment' by Goldberg *et al.* (National Academy of Sceinces–National Research Council). The author finds that Goldberg *et al.* based their estimate on a nonexistent figure from a limited study of DDT residues in rainwater in Great Britain (Tarrant and Tatton, 1968). He concludes: '...one is impressed with the majestic sweep of the imagination which extrapolated the handful of results reported from the 'tight little island' to a global figure.'

72-0015. Huehne, W. H. (Author address not given). **Experience with an insecticide/drug combination and obserations on suppressive chloroquine/pyrimethamine treatment.** *J. Trop. Med. Hyg. 74(5): 110-6; 1971.* (9 references)

Various malaria eradication programs carried out in West Malaysia from 1948 onward are reviewed. DDT spraying and mass administration of chloroquine-pyrimethamine tablets were used along and together in these programs. The efficacy of these approaches in malaria control is discussed in relation to mosquito species and geographical considerations.

72-0016. Nalewaja, J. D.; Mitich, L. W.; Dexter, A. (Dept. of Agronomy, State U. of Agriculture and Applied Science, Fargo, ND 58102). **Herbicides in North Dakota's environment.** *N. Dak. Farm Res. 28(4): 25-8; 1971.* (20 references)

The socioeconomic importance of herbicide use in North Dakota is discussed. Emphasis is given to the possible hazards of 2,4-D, the most extensively used herbicide in the state. After reviewing published reports on the subject, the authors conclude that 2,4-D presents no hazard to man or animals, either directly or from long-term buildup. Some danger to nontarget vegetation is seen in the atmospheric drift of 2,4-D. Drift can, however, be largely eliminated by observing proper application procedures. Contrary to the opinions of antipesticide groups, a hungry world can only be fed by the continued use of agricultural chemicals.

72-0017. Colberg, W. J.; Callenbach, J. A. (Author address not given). **Pesticides and the environment.** *N. Dak. Farm Res. 28(4): 32; 1971.*

In spite of adverse publicity about the environmental effects of pesticides, they will continue in use. While there are problems and potential hazards associated with pesticides, a complete ban on their use would be no solution. Problems will be solved by keeping open minds, gathering facts and conducting research.

72-0018. Pichirallo, J. (Author address not given). **PCB's Leaks of toxic substances raises issue of effects, regulation.** *Science 173(4000): 899-902; 1971.*

The growing controversy surrounding polychlorinated biphenyls (PCBs) in the environment is discussed. As a result of Ralph Nader's prodding, the Food and Drug Administration (FDA) admitted in August 1971 that it had seized 75,000 eggs contaminated with PCBs and that another shipment of 60,000 contaminated eggs had escaped inspectors and been sold in Washington, D. C., area stores. The source of contamination was a leak in a pipe of the cooling system of a North Carolina fish-meal plant. The leak began in April 1971 but was not remedied until July. In the meantime, 16,000 t of fish meal had been distributed to more than 60 companies in ten states. One purchaser of the chicken feed, Holly Farms, slaughtered 77,000 fowl when PCB levels as high as 40 ppm were discovered. The U. S. Department of Agriculture (USDA) announced that the chickens in the ten-state area were 'wholesome.' Laboratory researchers do not agree that PCBs represent an environmental hazards. While the Monsanto Chemical Company, the only domestic producer of PCBs, has reported that no adverse effects were found in rats fed up to 100 ppm of PCBs, other researchers have linked the compounds to liver damage in mice and lower fertility in birds. The aforementioned chicken-feed contamination was only detected after the hatchability of eggs from chickens fed the meal began to decline. Research conducted by the Environmental Protection Agency (EPA) showed that 1 ppm of PCBs killed 1/2 of test populations of shrimp. An accidental PCB leak in Japan in 1968 resulted in a severe skin disease in 300 people and symptoms or chlorobiphenyl poisoning in babies. The hazards if PCB residues in the environment are probably long-term. Critics charge that Federal agencies are not geared to handle anything but crises situations and that regulatory responsibilities are irrationally divided. While the FDA has responsibility for PCBs in whole-shell eggs and fish meal, the

USDA has control over cracked eggs, egg products and poultry. The EPA is in charge of PCBs in air and water. The regulation of PCBs escaping into the environment would be difficult in any case because of the lack of legal authority and because no one but Monsanto knows the composition of the compounds and the amounts produced.

72-0019. Blumenbach, D. (Dokumentationsschwerpunkt Pflanzenkrankheiten und Pflanzenschutz, Biologische Bundesanstalt fuer Land- und Forstwirtschaft, Berlin-Dahlem, Germany). **Pestizide in der Umwelt; eine Bibliographie ueber Nebenwirkungen, Rueckstaende und Schutzmassnahmen. [Pesticides in the environment; a bibliography on side effects, residues and control measures.]** *Mitt. Biol. Bundesanst. Land-Forstwirt. Berlin-Dahlem No. 141: 7-146; 1971.* (2368 references) (German)

An extensive bibliography on the side effects, residues and control of pesticides in the environment is given. The references are classified under the following headings: review articles; pesticide discussion; side effects on nature and man (general, pesticide and soil biology, pesticides and beneficial arthropods, pesticides and bees, pesticides and water biology, pesticides and fish, pesticides and birds including fowl, pesticides and wildlife, pesticides and mammals, pesticide toxicity *in vivo*, pesticide toxicity *in vitro*, sorption, metabolism and excretion, pesticides and man); residues in the environment and in food (general, residues in water, soil and air, residues in potatoes and beets, residues in vegetables, residues in fruit, residues in medicinal, spice and commercial plants, residues in cereals, cereal products and feedstuffs, residues in food, residues in animal products); diminution of pesticide damage (general, prevention, labor protection, public activities, legislation and tolerances and environmental plant protection).

72-0020. Moore, N. W. (The Nature Conservancy, Monks Wood Expl. Station, Abbots Ripton, Huntingdon, England). **Pesticides and conservation.** *Proc. Brit. Weed Contr. Conf. 10th, 3: 1032-5; 1970.* (3 references)

The conservation of wildlife is discussed with special reference to the increasing use of herbicides. Polarization of attitudes into pro- and antipesticide camps is unscientific and bad for agriculture and for conservation. Both agriculturalists and conservationists are serving the interests of mankind and their differences largely result from the very real difficulty in reconciling short- and long-term aims. Land use will inevitably become polarized; in the future, most of the food will be produced on intensively cultivated land which will become progressively less suitable for wildlife. As a result, more land will have to be set aside specifically for conservation. Cooperation about pesticides between the agricultural industry and official and voluntary conservation bodies in the United Kingdom has shown that artificial and harmful barriers between the two groups can be reduced and practical compromises achieved. (Author abstract)

72-0021. Anonymous. **Pesticide controls: What to watch for.** *Am. Fruit Grower 91(2): 14; 1971.*

Pending Federal and state legislation governing pesticides is reviewed. In general, the state legislation aims at accomplishing three objectives: to keep pesticides out of the hands of dealers and users not equipped to handle them; to limit the use of persistent pesticides; and to establish licensing and permit procedures. The proposed Federal Environmental Pesticide Control Act would divide pesticides into three categories: general use, restricted use and prescription only. Pesticides would be initially registered for 5 years and then for 3-year periods. Manufacturers would be required to submit new findings on environmental and health effects 3 years after the initial registration. Manufacturers would also be required to comply with the Federal Hazardous Substances Act.

72-0022. Anonymous. **Don't cut corners with pesticide safety.** *Am. Fruit Grower 91(1): 34; 1971.*

Advance safety planning should be a part of every pesticide user's program. Advise the family physician and the police and fire departments of what pesticides will be used so that they will be prepared to handle emergencies. Make preparations to keep accurate records before spraying operations begin. Check and calibrate spraying equipment in advance. Be informed about the laws regulating pesticide use. Follow directions on pesticide containers to the letter. Contact local extension services for the latest information on chemical uses. The *1971 Farm Chemicals Handbook* is a must for pesticide users. It is available for $17.50 from the Reprint Dept., Meister Publishing Co., Willoughby, Ohio 44094. Pesticide safety information may also be obtained from the National Agricultural Chemicals Association, 1155 Fifteenth St., N.W., Washington, DC 20005.

72-0023. Paoletti, A. (Catedra de Higiene, Facultad de Ciencias, Universidad de Napoles, Naples, Italy). **Contaminacion quimica del mar. [Chemical contamination of the sea.]** *Rev. Sanid. Hig. Pub. (Madrid) 44(7): 765-94; 1970.* (Spanish)

The most important chemical contaminants found in seawater are reviewed with emphasis on the importance of contamination from synthetic detergents, petroleum products and pesticides. The dangers of the toxicity of these products through the food chain(s) are pointed out from bacteria to microalgae to zooplankton to fishes to higher animals to man. In this fashion, these chemical products can reach toxic concentrations that are harmful directly to living beings or by way of a modification of the ecosystem. In the author's opinion, the sea is the best agent for eliminating toxic products. In the years to come, scientific research, without psychological or political prejudices, should fill in many of the current gaps in our knowledge of the degradation and neutralization cycles of chemical substances through biological and abiotic factors present in seawater. (Journal abstract edited).

72-0024. Anonymous. **Store pesticides under lock and key.** *Am. Vegetable Grower 19(5): 32; 1971.*

Proper storage is an integral part of pesticide safety. Always keep the storage area locked. Keep container labels visible. Always store pesticides in their original containers. Keep empty containers in a locked storage area until they can be properly disposed of. Store herbicides away from other compounds. Keep all containers out of direct sunlight. Do not allow people to eat or sleep in storage areas and do not store food and feed in the same area. Powders, granules and dusts must be kept dry and liquid pesticides cannot be allowed to freeze. A separate, well-marked building is ideal for pesticide storage. Any storage area should be well-ventilated, dry, temperature-controlled and close to electricity and water. The fire department should be informed of the kind and location of stored pesticides. When large quantities of pesticides are stored, an automatic sprinkler system and fire alarm should be installed. Provisions should be made to collect runoff water for transportation to a disposal area.

72-0025. Utagawa, T. (Wildlife Lab., Forestry Testing Station, Dept. of Agriculture and Forestry, Japan). **Effects of environmental pollution of birds and animals.** *Kogai to Taisaku 7(1): 35-9; 1971.* (Japanese)

The effects of environmental pollution together with crowding of the natural habitats by man threaten the existence of fauna even to the verge of extinction in some species. The earliest case to be noted by the authorities in Japan was mercury poisoning of storks which fed on small fish in rice paddies treated by pesticides. Heavy metals such as mercury are known to inhibit the normal mitotic process in the embryonic stage. Similar effects have been seen in herons, swallows, crows and other birds. It should be noted that the maximal allowable amount in man may be fatal to birds especially when it is accumulated within the body. Dumping of oil in water has been proved fatal to many water fowl the world over and immediate legislative action for prevention of this practice is vital in Japan. Almost as fatal as oil pollution is the heavy concentration of detergents in rivers and streams. The detergents remove the oily substance from the feathers and cause eventual drowning of water fowl. For the purpose of reducing the number of wild rats, sodium monofluroacetate or thallium preparations have been used which not only killed these wild pests but also reduced the number of their natural enemies, such as foxes, weasels and martens, which fed on the poisoned animals and suffered secondary poisoning as a result. Zinc phosphide preparation is recommended to prevent these unwanted incidents as it is quickly decomposed in the animal's stomach, thus preventing secondary poisoning. Herbicides have not caused any serious incidents involving fauna in Japan, although it is reported that the monkey colony of the Shimokita Peninsula has started to move in search of an new food source after the area was sprayed by herbicides last June. Occasional herbicide poisoning of cattle has been reported and the problem is now under study. More serious than environmental pollution, a high degree of industrialization and overcrowding have caused fauna to abandon their natural habitats resulting in an upset of the natural balance. The public is becoming more and more aware of this situation and a few attempts are being made to salvage the dwindling population in nature.

72-0026. Sonawane, B. R.; Knowles, C.O. (Dept. of Entomology, U. of Missouri, Columbia, MO 65201). **Phenmedipham and *m*-aminophenol decomposition in alkaline soil.** *Bull. Environ. Contam. Toxicol. 6(4):, 322-7; 1971.* (8 references)

The decomposition of carbon-14-labeled phenmedipham and one of its hydrolysis products, *m*-aminophenol, in an alkaline soil was investigated. The compounds were incubated with soil samples containing 20% distilled water for 0, 4, 8, 16 or 32 days. After incubation, the residues were extracted and then separated by thin-layer chromatography (TLC). Radio autographs were prepared and the radioactivity in the silica gel of the TLC plates corresponding to the darkened images on the film was measured in a liquid scintillation spectrometer. Most of the radioactive material extracted with methanol from the phenmedipham-treated samples partitioned into ethyl acetate; 2.6% was the maximum amount detected in the aqueous fraction. The radioactive material in the ethyl acetate fraction decreased from 89.6 to 22.5% of the applied phenmedipham in 32 days. Phemedipham and methyl-N-(3-hydroxyphenyl)-carbamate (MHPC) comprised a minimum of 96.8% of the radioactive material in this fraction. Low levels of *m*-aminophenol, an unknown compound and radioactive material at the TLC origin were also detected. Phenmedipham decreased from 87.4 to 49% in 8 days and remained relatively stable at this level through 32 days. At the same time, MHPC levels increased from 10.8 to 50% in 8 days and remained stable. Because appreciable radioactivity remained in the soil after methanol extraction, the soil residues were subjected to acid extraction and alkaline hydrolysis. The levels of radioactivity in the hydrochloric acid and sodium hydroxide fractions generally increased with time and reached maximums of 17.5 and 16.3%, respectively, of the applied phenmedipham after the 16-day incubation. A maximum of 26.1% of the applied phenmedipham remained in the soil after the 32-day incubation. The radioactive material in the ethyl acetate fraction extracted from *m*-aminophenol-treated soil rapidly decreased from 62.9 to 19.6% of the applied amount in 16 days. The parent compound was the major material in this fraction, but several unknown compounds were detected. The hydrochloric acid and sodium hydroxide fractions and the residual soil also contained significant amounts of radioactive materials throughout the experiment. It was concluded that phenmedipham is hydrolyzed in alkaline soils to *m*-aminophenol via MHPC. The *m*-aminophenol then undergoes physical adsorption and chemical reaction with various soil components.

72-0027. Chesters, G.; Konrad, J. G. (Dept. of Soil Science, U. of Wisconsin, Madison, WI 53706). **Effects of pesticide usage on water quality.** *BioScience 21(12): 565-9; 1971.* (66 references)

The sources and extent of water pollution by pesticides and the mechanisms by which pesticides are dissipated from the environment are reviewed. Direct application to surface waters and water runoff and particulate erosion from contaminated land are cited as the chief sources of pollution. Pesticides may be discharged in the effluent of industrial and sewage treatment plants. Reservoirs of pesticides may build up in the bottom sidiments of water bodies and be recycled into the water. Most aquatic pesticide pollution involves surface water. Owing to the properties of pesticides, only minute quantities of residues reach ground waters. Pesticides are dissipated from or moved from one part of the environment to another by adsorption, degradation, volatilization and plant uptake. Adsorption by soils and sediments varies with the pesticide, pH, temperature and clay and organic contents. Degradation products may be more toxic and persistent than the parent compounds. At constant pH, the extent of degradation is related by first-order kinetics to degradation times, but adsorption reactions strongly influence degradation rates. Plant uptake is a dissipation mechanism when a pesticide is degraded more rapidly in plants than in the surrounding environment. When plants take up but do not degrade pesticides, the compounds are eventually returned to the soil or sediment or become part of a food chain. Volatilization is affected by ground cover, the moisture content of the soil, adsorption, temperature and the vapor pressure of a pesticide. The Environmental Protection Agency regularly monitors streams for pesticide residues. The accumulation of the organochlorine pesticides is of particular concern. While these do not represent an immediate human health hazard, increasing evidence points to their harmful effects in fish and predatory birds. Periodic occurrences of high pesticide levels in water could probably be reduced by standard water treatments. These treatments are inadequate for the removal of long-term, low-level contamination. The removal of pesticides from large bodies of water is not presently feasible.

72-0028. Suzuki, T.; Nose, K. (National Inst. of Agricultural Sciences, Tokyo, Japan). **Decomposition of pentachlorophenol in farm soil. 1. Some factors relating to PCP decomposition.** *Noyaku Seisan Gijutsu 22: 27-30; 1970.* (9 references) (Japanese)

The following results were obtained from the study of pentachlorophenol (PCP) in farm soil. At low concentrations; e.g., 100 ppm, the rate of PCP decomposition varied among soils, but not at high concentrations; e.g., 1000 ppm. There were few differences in the rate of PCP decomposition at 20 and 28 degrees. Fungicide application on soils had marked influences upon PCP decomposition. Decomposition was accelerated by chloropicrin, little affected by pentachloronitrobenzene, suppressed slightly by tetramethylthiuram disulfide and by captan and suppressed by phenylmercury acetate as deeply as when the soils were steam-sterilized. 14-C-carbon dioxide liberation was observed on the day after 14-C-PCP was mixed with the soil and the 14-C-carbon dioxide/day curve reached a plateau in 5 days, while further decomposition of 14-C-PCP was demonstrated by the increase of radioactivity in a filtered solution of the steam distillation residue. (Journal abstract edited)

72-0029. Murai, T.; Tanaka, T. (National Inst. of Agricultural Sciences, Tokyo, Japan). **Studies on the evaporation of pesticides. 1. Evaporation of fenitrothion.** *Noyaku Seisan Gijutsu 22: 31-4; 1970.* (Japanese)

The influence of wind velocity on the evaporation of

fenitrothion was investigated. Air at 30 degrees was passed through the collection system, which contained cardboard treated with fenitrothion as the evaporation surface, at a rate corresponding to 0.5 to 4 m/sec. Fenitrothion vaporizing into the air was collected by scrubbing in cooled methanol and determined by gas chromatography. At the range of this airflow velocity, a linear relationship existed between the log of thr rate of evaporation (E) and the logarithm of wind velocity (V). The following equation was obtained: E=1.6V to the 0.8 power, where E is expressed in mcg/sq cm/hr and V in m/sec. Using this result with respect to the aerial ultra-low volume application of a fenitrothion-cellosolve solution, it appeared that when the wind velocity was 3 m/sec, and the spread factor 5, droplets of 10-, 50-, 100- and 200-micron diameter completely dissipated by evaporation in 5.0, 25.1, 50.2 and 100 hr, respectively, after application. (Journal abstract edited)

72-0030. Grice, R.E.; Hayes, M.H.B. (Chemistry Dept., U. of Birmingham, Birmingham B15 2TT, England). **Methods for studying the adsorption of organic chemicals by soil organic matter preparations.** *Proc. Brit. Weed Contr. Conf. 10th, 3: 1089-100; 1970.* (19 references)

The isolation of the components of soil organic matter and methods for studying the interactions which can take place in aqueous systems between these components and organic chemicals are described. Liquid-liquid and solid-liquid adsorption processes were shown to be involved in certain instances. The techniques used to study adsorption include the slurry method, gel filtration, pressure filtration and calorimetry. These are illustrated by investigations or interactions between *s*-triazine herbicides (particularly prometryne) and humic acid preparations in particular. (Author abstract)

72-0031. Ueda, K. (Dept. of Hygiene, Tokyo Dental Col., Tolsyo, Janan). **Agricultural chemicals--residual toxicity.** *Naika 27(5): 859-63; 1971.* (7 references) (Japanese)

Since 1971, parathion has been banned and low toxicity organophosphates have been recommended instead. Research interest has shifted from acute toxicity to the toxic effects of a minute quantity of chemical persisting in the environment. *Beta*-BHC, which amounts to 10% of the crude BHC, is chemically stable and liable to be one of the major pollutants persisting in the environment. It is selectively concentrated in the adipose tissue of beef cattle and secreted in the milk by cows. The chronic toxicity of *beta*-BHC is still under investigation by various agencies. WHO/FAO has established a practical residue limit (PRL) for *gamma*-BHC but no standard limit has been set for *beta*-BHC. The Japanese government has banned the use of BHC in agriculture but it should be kept in mind that contaminated milk has been on the market for more than 10 years now. The current interest in DDT is on its carcinogenic action in experimental animals. Also, it has been found that DDT causes birds to produce soft shells for their eggs. It is said that it acts as a carbonic anhydrase inhibitor and prevents deposition of calcium. Study on the concentration of residual organochlorides in the adipose tissue in man is not yet conclusive but the data collected at Kochi Prefecture on BHC are 40 times the figures derived in England or the United States. DDT in the same study is also higher than the international level. Although both DDT and BHC are severely restricted in their use and the residual toxicity is not yet established, close monitoring of their accumulation rate in the human body and early discovery of the result of environmental pollution are of primary importance for the future.

72-0032. Mitchell, J.E.; Hagedorn, D.J. (Dept. of Plant Pathology, U. of Wisconsin, Madison, WI 53706). **Residual Dexon and the persistent effect of soil treatments for control of pea root rot caused by** *Aphanomyces euteiches. Phytopathology 61(8): 978-83; 1971.* (8 references)

Soil samples from plots in five Wisconsin locations were analyzed for residues of Dexon (sodium-*p*-(dimethylamino) benzenediazosulfonate). The plots in which peas were grown were treated at 7.5, 15 or 30 lb/acre. The analyses showed that 50, 70, 80 and 90% of the applied Dexon disappeared after 1, 7, 21 and 90 days, respectively. The rate of Dexon disappearance varied with soil type and moisture content, but the trend was the same in all soils. Approximately 1 mcg of residual Dexon/g of soil was required to inhibit zoospore formation of *Aphanomyces euteiches*. An application of 30 lb Dexon/acre would be required to maintain this residual level for more than one growing season. Data on the efficacy of the Dexon treatments in increasing pea yields by reducing root rot are presented and discussed.

72-0033. Caseley, J.C. (ARC Weed Res. Organization, Begbroke Hill, Sandy Lane, Yarnton, Oxford, England). **Improved weed control techniques employing lower doses can reduce herbicide residues.** *Proc. Brit. Weed Contr. Conf. 10th, 3: 1071-8; 1970.* (15 references)

Techniques for reducing herbicide rates and thus environmental contamination are considered in terms of: 1) application technique; 2) dormancy breaking; 3) adjuvants including surfactants, lipophilic carriers, herbicide mixtures and miscellaneous additives; and 4) adjustment of herbicide treatment to suit climatic conditions. (Author abstract)

72-0034. Greve, P. A. (Lab. of Toxicology, National Inst. of Public Health, Utrecht, The Netherlands). **Chemical wastes in the sea: New forms of marine pollution.** *Science 173 (4001): 1021-2; 1971.* (2 references)

Drums containing chemical wastes have been found in and along the North Sea. The wastes were analyzed and were found to include lower chlorinated aliphatic compounds, vinyl esters, chlorinated aromatic amines and nitrocompounds and the insecticide endosulfan. Because dropping these drums into the sea endangers the environment and results in damage to fishing operations, measures should be taken to stop this practice. (Author abstract by permission, copyright 1971 by the American Association for the Advancement of Science)

72-0035. Anonymous. **Pesticide residues in food. Report of the 1969 Joint Meeting of the FAO Working Party of Experts on Pesticide Residues and the WHO Expert Group on Pesticide Residues, Rome, 8-15 December, 1969.** *World Health Organ. Tech. Rept. No. 458: vi, 43p; 1970.* (22 references)

Data on the toxicology and residues of certain pesticides were reviewed. When the data were sufficient, new residue tolerances and limits in food and acceptable daily intakes for man were proposed. Methods for the analysis of pesticide residues were discussed and recommendations for further research were made. The acceptable daily intakes, tolerances and the residue limits established as of December 1969, research needs established at the 1969 meeting, methods for calculating potential intakes of pesticides in diets and a glossary are given in appendixes.

72-0036. Duggan, R. E.; Lipscomb, G.Q.; Cox, E. L.; Heatwole, R.E.; Kling, R.C. (Food and Drug Admin., DHEW, Rockville, MD 20852). **Pesticide residues levels in foods in the United States from July 1, 1963 to June 30, 1969.** *Pesticides Monit. J. 5(2): 73-212; 1971.* (4 references)

An earlier report (this journal, *2(1): 2-46; 1967*) gave food residue data for the United States for the 4 years up to July 1, 1967. The present report updates this information with Food and Drug Administration data from July 1, 1967 and Department of Agriculture report data on red meat for July 1, 1964 to June 30, 1969 and on poultry for July 1, 1967 to June 30, 1969. The samples analyzed included "objective" (where there is no suspicion of excessive residues or misuse of pesticides, including all samples of imported foods), market basket and surveillance samples, the latter taken at major harvesting and distribution centers. The meat and poultry samples came from federally inspected slaughterhouses and from shipments offered for entry into the United States. Quantitative multiresidue gas-liquid chromatographic methods of analysis were employed at routine sensitivity levels of 0.03 ppm on most fruits and vegetables and of 0.01 ppm on the meat and poultry. Confirmatory tests, when required, used thin-layer chromatography or different GLC columns. The statistical processing of the data is described. Some 25 tables and graphs present the confirmed residue data from the monitoring efforts. These data cover raw agricultural products, dairy products, small and large fruits, grains and cereals for human consumption, leaf and stem vegetables, vine and ear vegetables, root vegetables, beans, red meat, poultry, eggs, fish, shellfish, animal grains, prepared infant and junior foods, the edible portion of tree nuts and vegetable oil seed products. The pesticides reported on include: aldrin, dieldrin, carbaryl, the DDT group, lindane, bromide, dichlorvos, heptachlor, malathion, parathion, dicofol and endrin.

72-0037. Lichtenstein, E. P.; Schulz, K. R.; Fuhremann, T. W. (Dept. of Entomology, U. of Wisconsin, Madison, WI 53706). **Effects of a cover crop versus soil cultivation on the fate and vertical distribution of insecticide residues in soil 7 to 11 years after soil treatment.** *Pesticides Monit. J. 5(2): 218-22; 1971.* (9 references)

The effects of a dense cover crop (alfalfa) and of repeated soil cultivations on the fate and vertical distribution of aldrin and heptachlor residues in soils were investigated. Eleven years after the application of the insecticides to the upper 4- to 5-in soil layer, large differences in the amounts of aldrin, heptachlor and their metabolites or formulation impurities were noticed between cultivated and alfalfa-covered soils. Soil cultivation--in comparison to noncultivation--resulted in a 76 to 82% reduction of residues derived from the originally applied insecticides. Of the totally recovered aldrin-dieldrin residues from alfalfa-covered soils, 52% were located in the upper 2 in of soil and 32% in the 2- to 4-in soil layer. In heptachlor-treated soils, however, 36% in the 2- to 4-in soil layer. In heptachlor-treated soils, however, 36% of the totally recovered residues were in the upper 2-in soil layer, while 52% were located in the 2- to 4-in soil layer. In addition, 5 to 6.5% of the totally recovered residues from aldrin- and heptachlor-treated soils, respectively, were located in the 6- to 9-in soil layer, primarily in the forms of dieldrin or heptachlor epoxide. (Another abstract by permission)

72-0038. Wiersma, G.B.; Sand, P. F.; Schutzmann, R. L. (Environmental Quality Branch, Pesticides Regulation Div., Pesticides Programs, Environmental Protection Agency, Washington, DC 20013). **National Soils Monitoring Program–six states, 1967.** *Pesticides Monit. J. 5(2): 223-7; 1971.* (4 references)

Six states were sampled in 1967 as a preliminary study of the National Soils Monitoring Program. The most commonly occurring pesticides were members of the DDT group, followed in turn by dieldrin and chlordane. Elemental arsenic was found on almost all of the sample sites. DDT, TDE and combined memebers of the DDT group (DDTR) were distributed equally over both cropland and noncropland sites, but DDE was more widely distributed on cropland areas. No difference could be detected between the proportion of sites with DDT, TDE and combined members of the DDT group (DDTR) on cropland from those on noncropland. But there was a significant difference between the proportions of sites with DDE on cropland and noncropland sites. (Author abstract by permission)

72-0039. Duke, T. W.; Wilson, Jr., A. J. (Gulf Breeze Lab., Environmental Protection Agency, Sabine Island, Gulf Breeze, FL 32561). **Chlorinated hydrocarbons in livers of fishes from the northeastern Pacific Ocean.** *Pesticides Monit. J. 5(2): 228-32; 1971.* (1 reference)

A preliminary study was done of pesticide levels found in fish livers from animals in the northeastern Pacific Ocean. The samples were taken either iced or forzen from the vessel. Ten fish of each species were collected when possible. About 10 g of liver or the entire liver in small fish were pooled from each of ten fish to give a composite of 50 to 100 g of liver tissue. The homogenized, processed specimens were analyzed within 30 days after a dessiccant had been added. The tissue was extracted for 4 hr in a Soxhlet, concentrated and partitioned with acetonitrile. After acetonitrile evaporation to dryness, the residue was eluted from a Florisil column. The

samples were then identified and quantitated by electron-capture gas chromatography. The analysis was for: BHC, heptachlor, aldrin, heptachlor epoxide, toxaphene, chlordane, methoxychlor, dieldrin, endrin and the *o,p'*- and *p,p'*-isomers of DDE, DDD and DDT. Recovery rates were greater than 85%. There was no significant interference from PCBs in the analysis for DDT and its metaholites. The results of the analysis are tabulated. They show that bottom-dwelling coastal fish from Santa Monica Bay contained much higher residues than did pelagic fish from the open ocean. No detectable residues were found in salmon in their fifth year of life and in their second or third year away from their "home" stream. The lack of liver residues does not preclude fat or muscle storage of pesticides but suggests only that the fish had not recently accumulated pesticides. Another table compares the liver pesticide residue levels with those for other tissues in selected fish.

72-0040. Haufe, W. O.; Morley, H. V. (Veterinary-Medical Entomology Sect., Res. Station, Canada Dept. of Agriculture, Lethbridge, Alberta, Canada). **Comparison of emulsifiable and wettable-powder formulations for efficacy and residues in the protection of beef cattle on irrigated pasture.** *Pesticide Res. Rept. 170-2; 1970.* (1 reference)

DDT 50% WP and DDT 25 EC (2.5 lb/gal) were compared for efficacy and residues in the protection of beef cattle on irrigated pasture from the horn fly, *Haemotobia irritans.* Twelve yearling heifers were assigned to four treatment schedules: two emulsifiable treatments both at 0.5% concentration and 4-qt volume with 3-week treatment intervals and two wettable powder treatments, one at 0.5% concentration (4 qt, 3-week treatment interval), the other at 0.25% concentration (2 qt) at 1-week intervals. Fly counts were performed at weekly intervals pretreatment and after treatment and averaged. The DDT residues remaining from the treatments in the fat at slaughter were detected for 1000-lb weight animals. The total DDT applied/three animals was: emulsifiable treatment–90.8 and 68.1; wettable powder treatment–68.1 and 62.2. The average number of flies/animal in the above treatments were pretreatment and posttreatment, respectively, 52 and 2.6, 33.6 and 4.7, 110.3 and 6.5 and 64 and 2.8. The total average pesticide residues (DDE, TDE and DDT in ppm) for the emulsifiable concentrate and wettable powder treatments and the three untreated controls were 5.73, 9.63 and 0.53, respectively. It is concluded that DDT application to growing beef cattle has to be limited to three, preferably two, treatments/grazing season in order to maintain residue levels below 7 ppm in the fat at prime slaughter weight. The recommended waiting period of 90 days between slaughter and final exposure is incompatible with economic management practices in scheduling the grazing and feedlot finishing of yearlings for prime slaughter weight in summer and fall.

72-0041. Haufe, W. O.; Morley, H. B. (Veterinary-Medical Entomology Sect., Res. Station, Lethbridge, Alberta, Canada). **Residues of DDT related to protection of beef cattle from biting flies on irrigated pastures.** *Pesticide Res. Rept. 172-5; 1970.* (1 reference)

The residues of DDT, 50% WP, used in the control of the horn fly *(Haematobia irritans)* and mosquitoes on beef cattle on irrigated pastures were evaluated. Eleven yearling heifers were given 11 weekly spray treatments, commencing June 27, with 2 qt 0.25% aqueous suspension of DDT at 350 psi to soak the head, neck, back and flanks. Four animals on a separate pasture were used as controls. Comparison was made with three heifers of similar age, selected from a commercial source to be finished for slaughter at 1000 lb. At slaughter, renal and loin fat samples were taken for residue analyses and further slaughter-run animal samples were taken at the same time to give background levels, slaughter classes and cattle grades. The cumulative dosage in relation to weight for the test animals was an average of 239 mg/kg, compared to commercial animals (schedule of three treatments at 0.5% concentration, 1 gal/head) averaging 260 mg/kg. Residue levels for DDE, DDD and DDT assessed at three times posttreatment and expressed as the average total (in ppm) were 24.9 (67 days), 21.6 (73 days) and 8.2 (81 days). Residues in controls were not detectable (less than 0.1 ppm). The total average residues (in ppm) in commercial feedlot heifers of finishing periods of 59 and 65 days were 21.5 and 12.7, respectively. The slaughter-run canner and subgrade stock all possessed nondetectable residue concentrations (less than 0.1 ppm). It is concluded that the frquency of treatment of grazing beef cattle on irrigated pastures for the broad spectrum control of biting flies would result in DDT residues in slaughter-animal fat in excess of the Canadian tolerance of 7 ppm at 90 days after final exposure.

72-0042. Fleeker, J.; Steen, R. (Dept. of Biochemistry, North Dakota State U., Fargo, ND 58102). **Hydroxylation of 2,4-D in several weed species.** *Weed Sci. 19(5): 507-10; 1971.* (12 references)

Wild buckwheat (*Polygonum convolvulus* L.), leafy spurge (*Euphorbia esula* L.), yellow foxtail (*Setaria glauca* (L.) Beauv.) and wild oat (*Avena fatua* L.) hydroxylated, in a 7-day period, 2 to 7% of the (2,4-dichlorophenoxy)acetic acid-1-14-C (2, 4-D-1-14-C) absorbed. Only a trace of hydroxylation products was detected in wild mustard (*Brassica kaber* (D. C.) L. C. Wheeler var. *pinnatifida* (Stokes) L. C. Wheeler), perennial sowthistle (*Sonchus arvensis* L.) and kochia (*Kochia scoparia* (L.) Roth). The investigation was limited to hydroxylation on the *para*-position of the herbicide. The predominant product, 2,5-dichloro-4-hydroxyphenoxyacetic acid, was detected in all the weed species studied. Also found in measurable amounts in some species were 2,3-dichloro-4-hydroxyphenoxyacetic acid and 2-chloro-4-hydroxyphenoxyacetic acid. The hydroxylation rate on the number four carbon of the ring did not account for the variation in susceptibility exhibited by these plants. (Author abstract by permission)

72-0043. Ragab, M. T. H.; Jackson, L. P. (Res. Station, Canada Dept. of Agriculture, Kentville, Nova Scotia, Canada). Aminotriazole residues in lowbush blueberry fruit. *Can. J.*

Plant Sci. 51(4): 331-2; 1971. (3 references)

No aminotriazole residues were detected in lowbush blueberry fruit *(Vaccinium angustifolium* Ait.*)* grown in plots treated at 5.6 kg active ingredient/ha. In one experiment, the plots were treated in November 1967 and burned off in early 1968. New plants grew in 1968 and the 1969 fruit yield was analyzed. In another experiment, the plots were burned off in March 1968. The herbicide was applied in October to the plants grown that summer and the 1969 fruit crop was analyzed for residues.

72-0044. Gaskin, D.E.; Holdrinet, M. (Dept. of Zoology, Col. of Biological Sciences, U. of Guelph, Guelph, Ontario, Canada). **Organochlorine pesticide residues in harbour porpoises from the Bay of Fundy region.** *Nature 233(5320): 499; 1971.* (5 references)

Blubber samples from 30 and liver samples from 12 harbor porpoises *(Phocoena phocoena)* taken in western North Atlantic waters during 1969-1970 were analyzed for organochlorine pesticide residues. The residues of total DDT (*p,p'*-DDE, *p,p'*-DDD, *o,p'*-DDT and *p,p'*-DDT) in the blubber were as follows (in ppm): weaned and adult males, 150.8 to 520.0; male sucklings, 75.1 to 186.7; female suckling, 154.80; immature and resting females, 111.6 to 447.9; and pregnant and lactating females, 40.0 to 122.0. Total DDT residues in the liver were as follows (in ppm): weaned and adult males, 1.97 to 3.32; immature and resting females, 0.61 to 3.57; and pregnant and lactating females 0.46 to 0.50. Dieldrin residues in the blubber were as follows (in ppm): weaned and adult males, 4.4 to 13.1; male sucklings, 0.6 to 10.0; female sucklings, 5.0; immature and resting females, 3.0 to 12.5; and pregnant and lactating females, 0.1 to 2.0. Dieldrin residues in the liver were as follows (in ppm): weaned adult males, 0.01 to 0.15; immature and resting females, 0.02 to 0.13; and pregnant and lactating females, 0.02.

72-0045. Briggs, G. G.; Ogilvie, S.Y. (Chemistry Dept., Rothamsted Expl. Station, Harpenden, Hertfordshire, England). **Metabolism of 2-chloro-4-methoxyaniline and some N-acyl derivatives in soil.** *Pesticide Sci. 2(4): 165-8; 1971.* (11 references)

3-Chloro-4-methoxyaniline at concentrations of 10 ppm or more in soil is converted to a mixture of 3,3'-dichloro-4,4'-dimethoxyazobenzene, 3-chlorobenzoquinone-4-(3-chloro-4-methoxy)-anil and its reduction product 2,3'-dichloro-4-hydroxy-4'-methoxy-diphenylamine, probably by a free radical mechanism. The herbicide metoxuron, N'-(3-chloro-4-methoxyphenyl)-N,N-dimethylurea, and its demethylated metabolites probably break down to the amine too slowly in soil for coupling products to be detected. 3-Chloro-4-methoxyacetanilide at 25 ppm rapidly gives rise to amine coupling products in soil slurries and ethyl N-(3-chloro-4-methoxyphenyl)-carbamate does so after 2 months in the slurries. (Author abstract by permission)

72-0046. Hambrook, J. L.; Howells, D. J.; Utley, D. (Chemical Defence Establishment, Porton Down, Salisbury, Wiltshire, England). **Degradation of phosphonates: Breakdown of soman (O-pinacolyl-methylphosphonofluoridate) in wheat plants.** *Pesticide Sci. 2(4): 172-5; 1971.* (16 references)

The fate of pinacolyl methylphosphonofluoridate (soman) in wheat has been studied. Using wheat grown in hydroponic culture and applying the compound soman via the culture solution, it has been shown that soman is rapidly hydrolyzed in the plants and that the resulting pinacolyl hydrogen methylphosphonate is further degraded to methylphosphonic acid. (Author abstract by permission)

72-0047. Moellhoff, E. (Farbenfabriken Bayer A. G., Pflanzenschutz A.T.E.A., Leverkusen-Bayerwerk, Germany). **Determination of trichlorfon and fenthion residues in animals of different species.** *Pesticide Sci. 2(4): 179-81; 1971.* (23 references)

The original (sic) results of analyses of residues of trichlorfon and fenthion and its metabolites following application of commercial products to cattle, sheep and pigs, together with the results taken from the literature are compared. Despite the use of higher dose rates of trichlorfon, residues are lower than those of fenthion after dermal application. On the other hand, the residues of trichlorfon that occur in the animals following oral application briefly approach the theoretical maximum level in the tissues. The results are discussed in relation to the physical and chemical properties of the pesticides and their metabolites. (Author abstract by permission)

72-0048. Pitois, M.; Bibard, G. (Shell Chimie, 27, Rue de Berri, Paris 8e, France). **Etude des residus dans la matiere grasse du lait provenant de vaches herbergees dans des etables traitees avec une preparation a base de chlorfenvinphos. [Study of the residues in the fatty portion of the milk from cows lodged in stables treated with a chlorfenvinphos-based preparation.]** *Rec. Med. Vet. Ecole Alfont 147(6): 577-81; 1971.* (5 references) (French)

Walls of two sheds, one old, the other more modern, were sprayed with a new insecticide, Supona (chlorfenvinphos) at twice the recommended dosage rate. The residues of the insecticide were determined in the fatty portion of the milk produced by cows admitted after the application and then kept continuously in the treated buildings. In the first shed under the special conditions, the level of residues in the milk fat was maximum 4 days after the application, (0.026 ppm) and decreased rapidly below the detection level. In the older shed, in the absence of normal cleaning of the floors and mangers, the residues in the milk fat rose to a maximum of 0.058 ppm 4 days after the spraying and then fell below the limit of detection. In this trial, it was noted that even under severe conditions of treatment, the whole milk residue level of the exposed animals did not at any time exceed 0.002 ppm. Samples taken subsequently contained residues at less than the limit of detection. (Author abstract edited)

72-0049. Scott, H. D.; Lutz, J. F. (University of Kentucky, Lexington, KY 40506). **Release of herbicides from clay minerals as a function of water content. I. Kaolinite.** *Soil Sci. Soc. Am. Proc. 35(3): 374-9; 1971.* (19 references)

The influence of water content on the release of six herbicides from kaolinite was studied. Kaolinite suspensions were treated with 14-C-labeled herbicides at rates of 1 and 4 mcg/g (based on the dry weight of the clay). Extracts of the soil solution were obtained at successively increased increments of pressure from 0.3 to 15 bars, using the pressure membrane extractor. The following determinations were made: 1) volume of extract for each pressure-increment, 2) concentration of herbicide in the extract, as measured by liquid scintillation, 3) amount of herbicide remaining, as calculated by difference and 4) pH of the extract. The results show that for all the herbicides used, except simazine, the concentration in the extracts decreased with increasing pressure increments. The decreases were greatest with diuron and chlorpropham. Simazine concentration was from two to three times greater in the high- than in the low-pressure extracts. High concentrations in low-pressure extracts suggest that plant availability is high and that movement with water could be a problem with high rainfall under field conditions. Fluometuron and 2,4-D were negatively adsorbed; the others were positively adsorbed. The order of release in terms of total recovery of herbicide applied at the 1-ppm rate was: fluometuron greater than 2,4-D greater than atrazine greater than chlorpropham greater than 2,4-D greater than atrazine greater than chlorpropham greater than simazine greater than diuron. The order was the same for the 4-ppm rate except that 2,4-D was greater than fluometuron. The total recovery of the herbicides in the extracts ranged from 12.0% for diuron to 92.1% for fluometuron. (Author abstract)

72-0050. Hodgson, R. H. (Metabolism and Radiation Res. Lab., Crops Res. Div., Agricultural Res. Ser., U.S. Dept. of Agriculture, Fargo, ND 58102). **Influence of environment on metabolism of propanil in rice.** *Weed Sci. 19(5): 501-7; 1971.* (17 references)

The metabolism of 3',4'-dichloropropionanilide (propanil) to 3,4-dichloroaniline (3,4-DCA) and N-(3,4-dichlorophenyl) glucosylamine (3,4-DCAG) was quantitatively modified in rice (*Oryza sativa* L. "Nato") by temperature and day length. The propanil, 3,4-DCA and 3,4-DCAG content of rice was determined 1, 2, 5 and 8 days after root treatment with 92 mcM propanil. Plants were grown and treated under long-day (16 hr) and short-day (12 hr) conditions with day temperatures of 32, 27 or 21 C and night temperatures of 21 C. The absorption and metabolism of propanil were most rapid under high temperature and long-day conditions. A mean value of 0.75 mcmoles total of aniline equivalent/plant was obtained. Greater quantities of 3,4-DCA and 3,4-DCAG were recovered from plants in high-temperature, long-day environments. An average of 47% of the propanil plus water-soluble metabolites in rice was in the root tissue. Conditions favoring high growth rates and transpiration increased the percentage in the shoots. Because of the increased tissue mass at high temperatures, mean concentrations of propanil plus water-soluble metabolites in plant tissue were reduced from 0.18 to 0.12 mcmoles/g dry weight. (Author abstract by permission)

72-0051. Abernathy, J. R.; Davidson, J. M. (Agronomy Dept., U. of Illinois, Urbana, IL 61801). **Effect of calcium chloride on prometryne and fluometuron adsorption in soil.** *Weed Sci. 19(5): 517-21; 1971.* (15 references)

The movement and adsorption of soil-applied 14-C-labeled 2,4-bis(isopropylamino)-6-methylthio-*s*-triazine (prometryne) and 1,1-dimethyl-3-(*alpha,alpha,alpha*-trifluoro-*m*-tolyl) urea (fluomenturon) in the presence of 0.01 and 0.5 N calcium chloride were studied. The soils were Ca++-saturated Eufaula loamy fine sand and Norge loam. In equilibrium adsorption studies, fluometuron adsorption was decreased and prometryne adsorption was increased by increasing the calcium chloride concentration from 0.01 to 0.5 N. The mobility of prometryne in the two water-saturated soils was decreased by an increase in calcium chloride concentration. Fluometuron mobility was unchanged by the two calcium chloride concentrations in Eufaula, but was greater in Norge at the higher calcium chloride concentration. The adsorption of each herbicide in the flowing system was less than that predicted by the distribution coefficient. Differences in calcium chloride concentration do not appear to influence the mobility of the two herbicides sufficiently at the soil-water flow rate used in this study to require changes in current field application practices. (Author abstract by permission)

72-0052. Smith, A.E. (Canada Dept. of Agriculture, Box 440, Regina, Saskatchewan, Canada). **Disappearance of triallate from field soils.** *Weed Sci. 19(5): 536-7; 1971.* (6 references)

Small field plots, 18 by 18 cm in size, were treated with S-(2,3,3-trichloroallyl) diisopropylthiocarbamate (triallate) at rates equivalent to 2.8 kg/ha at five sites in Saskatchewan. After one growing season (5 months), the residues remaining in the 0-5 and 5-10 cm levels of soil were determined by gas chromatographic analysis. At all locations, 16 to 27% of the applied herbicide was found in the top 5 cm, while negligible residues were detected at the 5-10 cm level. (Author abstract by permission)

52-0053. Jordan, P. D.; Smith, L. W. (Dept. of Botany, U. of Guelph, Guelph, Ontario, Canada). **Adsorption and deactivation of atrazine and diuron by charcoals.** *Weed Sci. 19(5): 541-4; 1971.* (4 references)

The adsorption of 2-chloro-4-(ethylamino)-6-(isopropylamino)-*s*-triazine (atrazine) and 3-(3,4-dichlorophenyl)-1,-1-dimethylurea (diuron) from aqueous solution by charcoal varied widely with the type of charcoal tested. However, adsorption in solution was directly related to the deactivating properties of the charcoals for the two herbicides in soil. Several charcoals deactivated residues of 0.3 ppmw of atrazine and 1.0 ppmw of diuron when they were present at concentrations of 30 to 50 ppmw in the soil. Activation of the charcoal was essential for the adsorption and deactivating properties. A simple laboratory test was developed for assessing activated charcoals for use in deactivation studies in soil. (Author abstract by permission)

72-0054. Flynt, T. O.; Riley, T. E.; Bovey, R. W.; Meyer, R. E. (Plant Science Res. Div., Agricultural Res. Ser., U.S. Dept. of Agriculture, College Station, TX 77843). **Auger soil sampler for herbicide residues.** *Weed Sci. 19(5): 583-4; 1971.*

A soil sampler was constructed for moisture and pesticide residue determinations that will retrieve soils with rock and heavy clay layers. The sampler consists of a commercially constructed worm-gear driven auger mounted in a 3.7 m tall verticle frame. Depth, speed, accuracy and ease of sample retrieval were substantially increased, compared to manual sampling. (Author abstract by permission)

72-0055. Vonk, J. W.; Sijpesteijn, A.K. (Organische Chemisch Institute TNO, Utrecht, The Netherlands). **Tentative identification of 2-imidazoline as a transformation product of ethylenebisdithiocarbamate fungicides. Pestic. Biochem. Physiol. 1(2): 163-5; 1971.** (4 references)

2-Imadazoline has been identified tentatively as a minor conversion product of ethylenethiourea in seedlings of cucumber and wheat. As ethylenethiourea is known to be present in plants after root treatment with ethylenebisdithiocarbamate fungicides, 2-imidazoline is assumed to be a terminal residue of these fungicides as well. (Author abstract)

72-0056. Raymond, D. G. M.; Alexander, M. (Lab. of Soil Microbiology, Dept. of Agronomy, Cornell U., Ithaca, NY 14850). **Microbial metabolism and cometabolism of nitrophenols.** *Pestic. Biochem. Physiol. 1(2): 123-30; 1971.* (12 references)

A bacterium able to use *p*-nitrophenol as a carbon and energy source was isolated from soil by enrichment culture. Nitrite was formed in stoichiometric amounts from *p*-nitrophenol by the organism and chloroform-treated resting cells generated 4-nitrocatechol from the same substrate. Cells grown on *p*-nitrophenol oxidized *m*-nitrophenol to nitrohydroquinone, but the organism did not use *m*-nitrophenol as a carbon source for growth. (Author abstract)

72-0057. Klein, D. A. (Dept. of Microbiology, Oregon State U., Corvallis, OR 97331). **Photomodification processing of biologically recalcitrant pollutants.** *IEEE Trans. Geosci. Electron. GE-8(3): 139-44; 1970.* (12 references)

Recalcitrant pollutants, such as pesticides, plastics and ligninsulfonates, a product of paper manufacture, are of increasing concern because microorganisms are not able to break these down at desirable rates. With insufficient rates of breakdown, one can observe an increasing accumulation of these materials in the environment. To aid microorganisms in metabolizing such materials, photolytic processes have been developed that show the potential of treating process streams, allowing more efficient microbial utilization. These systems can be envisioned for the production of microbial protein and for the pretreatment of materials before their release into natural environments. Photolysis efficiency is dependent on the wavelength of light used, with light in the ultraviolet range, from 180 to 210 nm being most effective. An active free-radical reacting reagent, such as oxygen, is required for efficient modification. After modification, a substrate can be used in growth chambers for the production of microbial protein or it can be treated in a lagoon system before release to a natural environment. Aspects of control and instrumentation, which should be considered in future large-scale uses of such processes, are discussed. (Author abstract)

72-0058. McDowell, L. L. Grissinger, E. H.; Bolton, G. C.; Parsons, D. A.; Barthel, W. F.; Hawthorne, J. C.; Ford, J. H. (USDA Sedimentation Lab., Soil and Water Conservation Res. Div., Agricultural Res. Ser., U.S. Dept. of Agriculture, Oxford, MS 38655). **Chlorinated hydrocarbon insecticide contamination of streambed sediments in the Mississippi River Delta.** *Proc. Miss. Water Resources Conf.: 9-19; 1971.* (3 references)

Partial data on chlorinated hydrocarbon insecticide residues in sediments from the Mississippi River and tributary streams are given. The complete report, "Pesticide residues in sediments of the lower Mississippi River and its tributaries" by W. F. Barthel *et al.*, was published in *Pesticides Monit. J. 3(1): 8-66; 1969* (for an abstract see 69-1196).

72-0059. Bollen, W. B.; Lu, K. C.; Tarrant, R. F. (Author address not given). **Effect of Zectran on microbial activity in a forest soil.** *U. S. Dept. Agr. Forest Serv. Pacific Northwest Forest Range Expt. Sta. Res. Note PNW-124: 11 p.; 1970.* (10 references)

As indicated by the evolution of carbon dioxide, 1 or 10 ppm of Zectran had no effect on the microbial activity of Astoria silty clay loam during 70-day incubation tests. When acetone was contained in the insecticide carrier, the evolution of carbon dioxide was increased. It was concluded that the low volumes of Zectran used in forest applications pose no hazard to soil microbes.

72-0060. Severi, G.; Doro, B. (Laboratorio Chimico Provinciale, Trieste, Italy). **Prime indagine sulla presenza di residui di alcuni antiparassitari nel latte delle provincie di Trieste, Udine e Pordenone. [Initial studies on the presence of some pesticide residues in the milk from Trieste, Udine and Pordenone Provinces.]** *Sci. Aliment. 16(4): 136-8; 1970.* (4 references) (Italian)

The residues of seven organochlorine pesticides (lindane, heptachlor, aldrin, heptachlor epoxide, dieldrin, *o,p'*-DDT, and *p,p'*-DDT) were determined in 52 samples of milk put on sale during the autumn-winter period of 1968-1969 on the markets of Trieste, Udine, and Pordenone. The amount of such residues was found to be globally less than the limit recommended by the United States Food and Drug Administration of 0.05 ppm. Only in two samples were values of 0.13 and 0.17 ppm determined. A table gives the results for all 52 samples analyzed; aldrin was the only compound not found in any of the milk examined. (Author abstract translated and modified)

72-0061. Way, J.M.; Newman, J. F.; Moore, N. W.; Knaggs, F. W. (Monks Wood Exptl. Station, The Nature Conservancy, Abbots Ripton, Huntingdon, England). **Some ecological effects of the use of paraquat for the control of weeds in small lakes.** *J. Appl. Ecol. 8(2): 509-32; 1971.* (20 references)

The results of treating two small lakes near Oxton, Nottinghamshire, England, with 0.5 mg paraquat/l are reported. One lake was treated in May 1965; the other was treated in July 1966. All submerged and floating plants except *Polygonum amphibium* and *Chara* sp. were eradicated within 32 days of the paraquat applications. One lake remained substantially free of vegetation for 2 years. The treatments did not significantly damage bankside or shoreline plants except *Typha latifolia*, one colony of which was severely affected. No mats of filamentous algae developed in the lakes. Diatoms and algae disappeared rapidly from the surface water and bacterial populations subsequently increased. The effects of paraquat on the subsurface algal and diatomaceous flora were difficult to interpret. It appeared that the treatment failed to kill the volvocacian and chloroccalian species and the diatoms *Cymbella* and *Fragillaria*, although the large chlorophyta and the cyanophyta were killed. The paraquat treatments did not appear to have affected species or populations of aquatic invertebrates, fish or birds. Deaths of a wide variety of invertebrates were observed after the 1965 treatment, but there was no change in species richness, as measured in taxa/unit area, 1 year after treatment. It appeared that the immature stages of water mites (genera *Limnesia* and *Piona*) survived better than adults during 4 days of observation after the 1966 treatment. Captive *Lymnaea* and *Sialis* in surface water were unaffected in 1966, but some adverse effect on *Asellus* was noted. In 1965, some free-living *Lymnaea* were found dead soon after the paraquat treatment. Paraquat residues in the water decreased rapidly and were undetectable within 16 days in one lake and within 4 days in the other. Significant quantities were taken up in the vegetation within 24 hr of the application. The maximum total residues in the mud were found 197 days after treatment, when 51% of the applied paraquat was recovered. Residues in the mud fell off markedly at 364 days.

72-0062. Casper, V.L.; Hammerstrom, R.J.; Robertson, Jr., E.A.; Bugg, Jr., J.C.; Gaines, J.L. (Gulf Coast Marine Health Sciences Lab.). **Study of chlorinated pesticides in oysters and estuarine environment of the Mobile Bay area.** *U.S. Dept. of Health, Education and Welfare, Public Health Ser., Consumer Protection and Environmental Health Ser., Environmental Control Admin., Bur. of Water Hygiene, Cincinnati, 1969. vii, 47 p.* (20 references)

Water, sediment and oysters were collected biweekly or monthly in Mobile Bay and in the Mobile and Tensaw Rivers, Alabama, from March 29 through July 23, 1965 and from October 12, 1965 through July 19, 1966. These samples were analyzed for aldrin, lindane, chlordane, DDD, DDE, *p,p'*-DDT, dieldrin, endrin, heptachlor, heptaclor epoxide, methoxychlor and toxaphene. DDT and its metabolites were the most frequently found of all the pesticides, followed by dieldrin, endrin and chlordane. The other pesticides were not detected or were found at very low levels. DDD and DDE were detected in all 82 oyster samples, while DDT was found in 99% of them. DDD was found in all 65 sediment samples, while DDE and DDT were found in 64 samples. DDT, DDD and DDE were detected in 79, 80 and 84%, respectively, of the 131 water samples. The median residues of DDT, DDD and DDE were respectively as follows (in ppm): in oysters--0.03, 0.11 and 0.23; in water--less than 0.001 for all; and in sediments--0.003, 0.005 and 0.005. Seasonal and geographic variations in the total DDT residues were evident in the oyster samples. Peak DDT levels occurred in late winter and early spring and coincided with maximum inflows of fresh water and minimum salinities. The highest total DDT residues in oysters were found in samples taken from Cedar Point Reef. The pesticide levels in the oysters were not considered significant in terms of human health. A map showing the sampling locations is reproduced and the results of the analysis are given in tables.

72-0063. Soedergren, A. (Dept. of Animal Ecology, U. of Lund, Lund, Sweden). **Accumulation and distribution of chlorinated hydrocarbons in cultures of *Chlorella pyrenoidosa (Chlorophyceae).*** *Oikos 22(2): 215-20; 1971.* (20 references)

The accumulation and distribution of lindane, *p,p'*-DDE and Clophen A 50 (PCB) have been studied in continuous flow cultures of *Chlorella pyrenoidosa* Chick. In estimating the cell volumes of algae in the culture, a technique has been developed using centrifugation in a modified hematocrit tube; a relationship between this method and cell counting methods has been established. By means of gas chromatography, samples of algae, water and air taken within the culture system were analyzed for residues of the tested substances. Lindane was accumulated by the algae but was also distributed in the water and air of the culture. Clophen A 50 and *p,p'*-DDE were taken up by the algae to a great extent and only a small part remained in the water. At the end of the experiments, 82 and 88% of the *p,p'*-DDE and Clophen A 50, respectively, was accumulated by the algae. There were no disturbances of the growth rate of the cultured algae due to the presence of the test substances. (Author abstract modified)

72-0064. Kawatski, J. A.; Schmulbach, J. C. (Biology Dept., Viterbo Col., La Crosse, WI 54601). **Accumulation of insecticide in freshwater ostracods exposed continuously to sublethal concentrations of aldrin or dieldrin.** *Trans. Am. Fisheries Soc. 100(3): 565-7; 1971.* (3 references)

The accumulation of aldrin and dieldrin in ostracods (Chlamydotheca arcuata Sars) was determined after exposures to 0.01 or 0.10 ppb of either insecticide in aquariums for 64 weeks. During the first 25 weeks, 1/5 of the aquarium water was replaced each week with fresh insecticide-containing water to maintain the theoretical insecticide concentration. At the end of 25 weeks, no residues were detected in the water. Residues (mostly dieldrin) in the algae were 235 to 3000 times the initial concentration of pesticide in the water. After the 25th week, the amount of insecticide added to each aquarium/week was increased tenfold. Eight weeks after the dose increase, residues were detectable in the water and they had increased in the algae. Dieldrin was detectable in both water and algae 23

weeks after the dose increase. All aldrin had been converted to dieldrin. At this time, no further additions of insecticide were made. At the end of 64 weeks, the dieldrin residues recovered from the ostracods were 12,000 to 260,000 times greater than the initial theoretical insecticide concentrations in the water. The insecticides apparently did not interfere with ostracod reproduction. The median 24-hr immobility tolerance limits for aldrin and dieldrin against this species of ostracod were estimated at 1.15 and 2.45 ppb, respectively.

72-0065. Korschgen, L. J. (Missouri Dept. of Conservation, Jefferson City, MO 65101). **Disappearance and persistance of aldrin after five annual applications.** *J. Wildlife Management 35(3): 494-500; 1971.* (15 references)

Residues of aldrin and dieldrin were determined in soil samples and earthworms *(Allolobophora caligimosa)* taken from an aldrin-treated field near Marshall Junction, Missouri. The field was treated annually with aldrin at 1.5 lb/acre from 1960 through 1964. Sampling began in 1965 and extended into 1970. Soil and earthworms were taken in the spring and fall of each year for analysis. Over 95% of the aldrin had disappeared when the first samples were taken. There was no significant reduction in residues throughout the years of sampling. In the soil, aldrin residues ranged from 0 to 0.05 ppm; dieldrin ranged from 0.05 to 0.17 ppm. In the earthworms, aldrin ranged from 0.01 to 0.34 ppm and was detected in 13 of 22 pooled samples; dieldrin was detected in all pooled samples and ranged from 0.20 to 1.26 ppm.

72-0066. Hoffman, G. O. (Texas A&M U., College Station, TX 77840). **Practical use of Tordon 225 mixture herbicide on Texas rangelands.** *Down Earth 27(2): 17-21; 1971.* (5 references)

Soil, grass and runoff water from Texas rangelands treated with Tordon 225 at 0.25 to 1.0 gal/acre were analyzed for residues of picloram. Of 78 soil samples analyzed, ten contained residues of picloram ranging from a trace to 0.120 ppm. No detectable residues remained in soil beyond 18 months, regardless of the application rate. Residues in grass from 72 to 170 days following application ranged from 0 to 6.9 ppm. These concentrations are not considered hazardous to grazing animals. Picloram moved from treated areas in surface runoff water when rainfall was received shortly after the Tordon application. No residues could be detected in the runoff 120 days after treatment.

72-0067. Stecko, V. (Dept. of Plant Husbandry, Agricultural Col. of Sweden, S-750 07 Uppsala 7, Sweden). **Comparison of the persistence and the vertical movement of the soil-applied herbicides simazine and bromacil.** *Proc. Brit. Weed Contr. Conf. 10th 1: 303-6; 1970.* (8 references)

Field experiments showed that the behavior of simazine and bromacil in clay and sandy soils was different. In sandy soil, bromacil had a longer persistence than in clay soil, while the situation for simazine was the opposite. The phytotoxicity of simazine ceased first in the deeper soil layer; bromacil, on the other hand, disappeared first from the upper soil layer. (Author abstract)

72-0068. Geissbuhler, H.; Guth, J. A. (CIBA Agrochemical Div., Basle, Switzerland). **Behaviour of urea herbicides in soil with special reference to environmental contamination problems.** *Proc. Brit. Weed Contr. Conf. 10th 1: 307-13; 1970.* (16 references)

Following guidelines for studying the impact of pesticides in the environment issued by the U. S. Department of Agriculture, this paper tries to evaluate the potential hazards presented by urea herbicides in the environment. Results of field dissipation studies, adsorption and leaching measurements and of a groundwater contamination experiment are reported. In addition, the various mechanisms of degradation of urea herbicides are discussed. All the results presented indicate that urea herbicides do not represent a significant hazard with regard to contamination of the environment. (Author abstract)

72-0069. Daris, B. T.; Papadopolou, C.; Kelperis, J.; Grimanis, A. P. (Vine Inst. Lykovrissis-Kifissias, Athens, Greece). **Herbicide influence on the arsenic uptake of grapes; a study by neutron activation analysis.** *Proc. Brit. Weed Contr. Conf. 10th 1: 429-33; 1970.* (13 references)

A 4-year experiment with paraquat and atrazine, carried out in a vineyard in southern Greece, resulted in *Sorghum halepense* being selected out. To control this remaining weed, we then applied monosodium acid methylarsonate (MSMA) with success. In order to investigate the uptake of arsenic from MSMA by the vines, grape samples were analyzed using neutron activation analysis. For this purpose, dried grapes were irradiated with neutrons for 10 hr at the Democritos Nuclear Reactor. The arsenic (As) content was calculated from the induced activity of 76-As after a radio-chemical separation. The results show that the quantity of As in grapes taken from a vineyard treated with MSMA, after a 4-year application of atrazine, is five times higher than in the control (0.24 to 0.28 mcg As/g dry matter instead of 0.04 to 0.07), whereas in plots treated with MSMA after a 4-year application of paraquat, the As content of the fruit was twice as high as in the control (0.08 to 0.11 mcg As/g). Consequently, it would seem that atrazine increases the uptake of As by the vine. (Author abstract)

72-0070. Clay, D. V.; McKone, C. E. (ARC Weed Res. Organization, Begbroke Hill, Sandy Lane, Yarnton, Oxford, England). **The tolerance of blackcurrants to chlorthiamid and dichlobenil; effects on growth and yield and residues in the soil.** *Proc. Brit. Weed Contr. Conf. 10th 2: 781-7; 1970.* (8 references)

The tolerance of blackcurrants to annual treatments with chlorthiamid at doses up to 48 lb/acre and dichlobenil at doses up to 24 lb/acre was tested over a 3-year period. There was no reduction in crop growth or fruit yield resulting from

any of the treatments. The higher rates of chlorthiamid (24 and 48 lb/acre) caused noticeable slight marginal chlorosis of expanded leaves at the edge of the leaf canopy in summer each year. Residues of chlorthiamid and dichlobenil measured (as total benzonitrile) in soil samples taken from the treated plots in March 1969 and 1970 before the annual herbicide application showed that 90% or more of the annual dose of herbicide had dissipated. Chlorthiamid appeared slightly more persistent than dichlobenil; residues were largely confined to the top 4 in of soil. (Author abstract)

72-0071. Audus, L. J. (Bedford Col., U. of London, London, England). **The action of herbicides on the microflora of the soil.** *Proc. Brit. Weed Contr. Conf. 10th 3: 1036-51; 1970.* (86 references)

A survey of the current literature on the effects of herbicides at concentrations representing normal rates of field application shows that research so far has been largely empirical and concerned with gross effects on populations of soil microorganisms and the biochemical processes they perform. Many observations have been made on changes in gross population patterns, but because of the complexity of the ecological situation and of the intricate interactions between the various components of the microflora, unequivocal information on the direct effects of herbicides on microorganisms in the soil and of the precise nature of the disturbances of soil equilibria is difficult to obtain. An analysis is made of the various ways in which herbicides could have an influence, both direct and indirect, on the populations of various types of soil microorganism and on their mutual interactions. (Author abstract)

72-0072. Rotini, O. T.; Levi-Minzi, R. (Istituto di Chimica Agraria, Universita di Pisa, Pisa, Italy). **La degradazione dei prodotti antiparassitari nel terreno agrario. [The degradation of pesticide products in farm land.]** *Notiz. Mal. Piante No. 82-3: 9-36; 1970.* (52 references) (Italian)

The interrelationships are reviewed between pesticides and crop production, pesticides and the natural biological equilibria and between pesticides and the integrity of the physical, chemical and biological characteristics of farm land. The Italian law (D.P.R. of August 3, 1968, No. 1255) which regulates the production, trade and sale of pesticides and food residues takes into account their toxic effects not only on man and on domestic animals but also is concerned in particular with their action(s) on natural balances and on activities which affect the biological cycles of farm land. After examining the activity and persistence in soil of certain individual products (e.g., aldrin, chlordane, DDT, etc.), the influence of pesticides is discussed as they affect the processes in farm land of: mineralization, ammonification, nitrification, atmospheric nitrogen fixation, cyanamide lysis, ureolysis and the interrelations with absorptive compounds. A number of compounds are reviewed individually for their fungicidal, insecticidal and herbicidal actions, taking into account the risks of intoxication, their persistence and thus their safety time limits. The different factors that influence the persistence of pesticides in soil and plants are considered from the point of view of being able to detail the modality of use of these products. (Author abstract translated and modified)

72-0073. Foschi, S.; Cesari, A.; Ponti, I.; Bentivogli, P. G.; Bencivelli, A. (Istituto di Patologia Vegetale, Universita degli Studi, Bologna, Italy). **Indagine sulla degradazione e movimento verticale dei fitofarmaci nel terreno. [Study of the degradation and vertical movement of pesticides in soil.]** *Notiz. Mal. Piante No. 82-3: 37-49; 1970.* (8 references) (Italian)

Because of the major practical interest in the use of pesticides in soil disinfestation, an investigation was done of the persistance and vertical movement of pesticides in the soil from the viewpoint of the potential danger to man of residues. The study showed that DDT, dieldrin, captan and Benlate (benomyl) have about the same degree of persistence; Thiodan (endosulfan) and Sevin (carbaryl) have a somewhat lesser degree of persistence. The organophosphorus compounds considered have shown much more rapid degradation than the former. In regard to vertical movement, it was found that while lindane and aldrin are almost completely retained at the 0 to 40 cm soil level, traces of dieldrin can be found even at 60 cm. Thimet (phorate) was detected, even if in negligible amounts, at a depth greater than 60 cm. (Author abstract translated and modified)

72-0074. Baluja Marcos, G.; Serrano Gonzalvez, L. (Instituto de Quimica Organica General, Patronato Juan de la Cierva, Madrid, Spain). **Contaminacion del medio por plaguicidas organoclorados. V. La adsorcion-desorcion de lindano y aldrin por dos clases de suelos agricolas nacionales. [Environmental contamination by organochlorine pesticides. V. The adsorption-desorption of lindane and aldrin by two types of national agricultural soils.]** *Rev. Agroquim. Tecnol. Aliment. 10(4): 486-98; 1970.* (22 references) (Spanish)

The composition of two soil samples from the agricultural zones of Burjasot (Valencia) and Logrono, Spain, were determined in order to relate adsorption and desorption of lindane and aldrin to the components and physicochemical properties of the samples, mainly to their content of organic matter and clays. It was possible to deduce that binding forces of a distinct kind interfere in the adsorption, according to whether organic matter of clay predominated, in combination with the differing polarities of the insecticides. But no processes of ionic exchanged were observed. The practical conclusions are that the Burjasot soil is decontaminated more rapidly from lindane, due, probably, to its lower organic matter content. The Logrono soil retained a higher proportion of the insecticide. Aldrin was adsorbed more rapidly by the Burjasot sample with a higher content of clay, but it was retained completely by both soil samples. This adsorption-desorption equilibrium significantly influences dispersion of the insecticides in the environment and their contamination of fluvial currents. (Author abstract translated) Part IV of this article appeared in *Anales Quim. 66(2): 157-66; 1970;* for an abstract see 71-0845.

72-0075. Yule, M. N.; Cole, A. F. W.; Hoffman, I. (Chemical Control Res. Inst., Ottawa, Ontario, Canada). **A survey for atmospheric contamination following forest spraying with fenitrothion.** *Bull. Environ. Contam. Toxicol. 6(4): 289-96; 1971.* (10 references)

Five air-sampling stations were set up around a 3-million-acre area in New Brunswick, Canada, to measure the phosphorus content of the air during a 4 week fenitrothion spraying project carried out in 1969. The air-sampling apparatus consisted of a Florisil filter column linked in series with a bubbler containing dimethylformamide (DMF). The air intake, set 5 ft above the ground, was operated at 12 L/min to simulate human breathing. The Florisil and DMF were changed daily and samples were analyzed by a modified total phosphorus method (Broderick *et al.*, 1967). The results of these analyses are presented in graphs. The phosphorus content of the air increased briefly at the beginning and end of the spraying program, during which about 700,000 lb of fenitrothion were aerially applied. The amount of phosphorus collected daily represented less than 0.01 mg/kg body weight that might have been inspired per human/day. It was concluded that the fenitrothion spraying operation presented no hazard to human health.

72-0076. Burns, R. G. (Dept. of Soils and Plant Nutrition, U. of California, Berkeley, CA 94720). **The loss of Phosdrin and phorate insecticides from a range of soil types.** *Bull. Environ. Contam. Toxicol. 6(4): 316-21; 1971.* (11 references)

The disappearance of Phosdrin (mevinphos) and phorate from five kinds of soil was studied. The insecticides (0.2 mg in 0.5 ml hexane) were incubated at room temperature with 2 g of soil held at 75% water-holding capacity. The Phosdrin-treated soils were incubated for 0, 3, 6, 12, 48, 72, 96 or 144 hr. The phorate-treated soils were incubated for 0, 1, 2, 3, 6, 12, 24 or 48 days. After the incubation period, the pesticide residues were extracted and measured by gas chromatography. Sterile soils were used as controls. Phosdrin disappeared rapidly from nonsterile muck, clay and peat soils. The much slower loss rates in sterile samples indicated that microorganisms were active in these soil types. Phosdrin losses from two sandy soils were much slower and the difference between sterile and nonsterile samples was small. Volitalization apparently accounted for losses from these soil types. The results with phorate were similar. The disappearance of the insecticides from the five soils as a function of time and the properties of the soils are given in tables.

72-0077. Kiigemagi, U.; Terriere, L. C. (Dept. of Agricultural Chemistry, Oregon State U., Corvallis, OR 97331). **Losses of organophosphorus insecticides during application to the soil.** *Bull. Environ. Contam. Toxicol. 6(4): 336-42; 1971.* (4 references)

Experiments with Zinophos (thionazin) and Dyfonate (N-2790) were undertaken to study the extent of pesticide loss from spray tank to soil and during the first 24 hr in the soil. Zinophos was sprayed on plots at the rate of 3.54 lb/acre; Dyfonate was applied at 3.87 or 4.78 lb/acre. Soil samples were taken for residues analysis immediately after the spraying. The results showed that nearly 40% of the Zinophos and up to 24% of the Dyfonate never reached the soil, even though the distance between the spray nozzle and the soil surface was short and the weather was calm. Losses from the soil during the first 24 hr were negligible regardless of whether a plot had been tilled after spraying or not.

72-0078. Kiigemagi, U.; Terriere, L. C. (Dept. of Agricultural Chemistry, Oregon State U., Corvallis, OR 97331). **The persistence of Zinophos and Dyfonate in soil.** *Bull. Environ. Contam. Toxicol. 6(4): 355-61; 1971.* (8 references)

To determine the persistence of Zinophos (thionazin) and Dyfonate (N-2790) in soil, samples from treated plots were analyzed for residues. Dyfonate was sprayed at 4.78 lb active ingredient/acre on plots near Corvallis, Oregon. Zinophos was sprayed at 2, 2.5, 5 or 10 lb active ingredient/acre on plots near Corvallis and at Prosser, Washington. Based on periodic analysis of soil samples for 120 days after treatment, the half-life of Dyfonate under western Oregon summer conditions was estimated at 40 days. During the first 14 days after the pesticide application, the rate of decline was 0.062 mcg/g soil/day; after 84 days the rate was 0.004 mcg/g soil/day. Four months after treatment, 27% of the amount applied was recovered. It is suggested that in the first 2 weeks after application, physical factors such as volatilization accounted for most of the pesticide loss, whereas chemical and biological mechanisms accounted for the losses in later stages. The half-life of Zinophos under summer conditions was estimated at 13 to 17 days, depending on the rate of application. Under winter conditions, the half-life was longer. In western Oregon, it was 14 to 18 weeks, while in eastern Washington it was 17 to 22 weeks. About 80% of the applied pesticide was lost in 6 months at both locations. It was concluded that temperature was the most important climatic factor in the loss of the pesticides from the soil. Rainfall had very little influence.

72-0079. Liu, L. C.; Cibes-Viade, H. R.; Gonzalez-Ibanez, J. (Agricultural Experiment Station, Mayaguez Campus, U. of Puerto Rico, Rio Piedras, PR 00931). **Persistence of several herbicides in a soil cropped to sugarcane.** *J. Agr. Univ. Puerto Rico 55(2): 147-52; 1971.* (5 references)

Experimental plots were treated with ametryne, diuron, fluometuron, norea and prometryne at the rates of 4, 8, 16, and 32 lb/acre. Terbacil was applied at the rates of 2, 4, 8, and 16 lb/acre 13 months prior to soil sampling. Herbicide residues in soil samples collected from the experimental plots were bioassayed using oats (*Avena sativa* L.) as the indicator plant. Residues present in the soil at the 0-4 in depth were found to be relatively low in plots treated with 4 lb/acre of ametryne, diuron, fluometuron, norea or prometryne, or 2 lb/acre of terbacil. Residues were found to increase in the 0-4 in depth as the rate of herbicide was increased. Fluometuron and diuron were detected at rather high concentrations when applied at 16 and 32 lb/acre. At the corresponding higher rates, only small to moderate amounts of ametryne, norea, prometryne and terbacil were detected. In general, fluometuron, diuron,

ametryne and prometryne did not penetrate in appreciable amounts beyond the 0-4 in depth regardless of the concentration. However, the greatest amount of terbacil and norea were found to accumulate in the 4-8 in and 8-12 in depths, respectively. (Author abstract)

72-0080. Pitois, M.; Bibard, G. (Sante Animale, Shell Chimie, 27, Rue de Berri, Paris 8e, France). **Etude des residus de crotoxyphos detectables dans le lait de vaches traitees par poudrage dans des conditions experimentales. [Study of the crotoxyphos residues detectable in the milk of cows treated by dusting under experimental conditions.]** *Rec. Med. Vet. Ecole Alfort 147(5): 507-11; 1971.* (2 references) (French)

Crotoxyphos (Ciodrin) formulated as 3% dust was applied daily for 15 days to the backs of lactating cows. One group received 10 g daily, another 30 g daily. The level of detectable residues observed by gas-liquid chromatography was no greater than 0.025 ppm in the fatty portion of the milk. (Journal abstract edited)

72-0081. Naumann, K. (Institut fuer Phytopathologie der Deutschen Akademie der Landwirtschaftwissenschaften zu Berlin, 432 Aschersleben, Theodor-Roemer-Weg-4, German Democratic Republic). **Zur Dynamik der Bodenmikroflora nach Anwendung von Pflanzenschutzmitteln; IV. Untersuchungen ueber die Wirkung von Parathionmethyl auf die Atmung und die Dehydrogenase-Aktivitaet des Bodens. [The dynamics of the soil microflora after application of plant protective agents; IV. Investigations on the effects of methyl parathion on respiration and dehydrogenase activity of the soil.]** *Zentr. Bacteriol. Parasitenk. Abt. II; Naturw. 125: 119-33; 1970.* (39 references) (German)

The insecticide "Wofatox Spritzpulver W6430" contains methyl parathion as the active ingredient. Application of 550 ppm or greater initially decreased soil respiration, as measured by the Warburg technique. After a few hours, however, the oxygen consumption increased, surpassing the respiration of untreated soil. Stimulation of oxygen consumption by parathion was greater in sand and compost soil than in loam soil. The addition of 0.5% methyl parathion increased the mineralization of glucose in loam soil. Repeated applications of 0.5% methyl parthion demonstrated that after the third application there was no further stimulation of the respiration rate (oxygen consumption/hr.). In this case, the toxic limit was presumably surpassed. The dehydrogenase activity in loam soil treated with high doses of methyl parathion was nearly completely blocked. (Author abstract modified)

See also **72-0007** **72-0019** **72-0023** **72-0025** **72-0085** **72-0092** **72-0094** **72-0106** **72-0110** **72-0114** **72-0115** **72-0132** **72-0140** **72-0141** **72-0151** **72-0160** **72-0170** **72-0175** **72-0176** **72-0177** **72-0178** **72-0179** **72-0188** **72-0190** **72-0192** **72-0198** **72-0199** **72-0205** **72-0206** **72-0209** **72-0210** **72-0211** **72-0213** **72-0215** **72-0216** **72-0217** **72-0220** **72-0221** **72-0226** **72-0228** **72-0229**

72-0082. Telegina, K. A.; Bikbulatove, L. I. (Ufa Res. Inst. of Hygiene and Occupational Diseases, Ufa, USSR). **Sostoyaniye kozhi u kontaktiruyushchikh s metoksonom v usloviyakhy ego promyshlennogo proizvodstva. [State of the skin in persons in contact with Methoxone during its industrial production.]** *Vestn. Dermatol. Venerol. 44(8): 76-9; 1970.* (8 references) (Russian)

The state of the skin in subjects occupied in the manufacture of the selective herbicide Methoxone [2M-4Kh; Dicotex; MCPA] was studied dynamically. Skin disease was detected on the first examination in 18 out of 158 and on the second examination in six out of 135 workers. The skin lesion had the appearance of a simple contact dermatitis. Methoxone causes a local stimulating action; it produces limited subacute inflammation of the skin. Repeated contacts with the herbicide do not lead to dissemination of the process but often to local reoccurences. From the character of the clinical picture of the dermatitis, the negative focal and local reactions to skin tests with drops of concentrated aqueous solutions of Methoxone and from the absence of pronounced eosinophilia in the peripheral blood in the subjects, the preparation may be classed as one of those chemical substances that do not have a sensitizing action on the skin. The dermatitis that they cause may rather be called simple or contact. To prevent occupational dermatitis in the manufacture of Methoxone, together with sanitary technical and hygienic measures, a measure of individual protection should be observed. Protect the skin of hands and face from the irritating action of the product with A. B. Selisskii's ointment (on a starch base), N. N. Chumakov's paste, etc.; protect the mucous membranes of the upper respiratory tracts by using a respirator of the ShB-1 'Lepestok' type of multilayered gauze bandages. When the work is finished, take a shower using superfatted or low-alkaline soap; after the hygienic shower, apply a softening, nutrient cream (Unna's cream, cold cream or other preparation) to the skin of the face and hands. (Author abstract translated and modified)

72-0083. Bonderman, D. P.; Mick, D. L.; Long, K. R. (Dept. of Clinical Pathology, Indiana U. Medical Center, Indianapolis, IN 46202). **Occupation exposure to aldrin, 2,4-D and 2,4,5-T and its relationship to esterases.** *Ind, Med. Surg. 40(6): 23-7; 1971.* (18 references)

The adaptive response of some esterase enzymes has been examined in a paired study of 20 formulators with occupational exposure to aldrin, 2,4-D and 2,4,5-T. The formulators and their matched controls were grouped according to type of compound formulated, tested statistically to determine if the measured enzymes were stimulated by exposure, if there was any difference in enzyme activity due to type of duration of exposure and if there was any correlation between measurable residues in blood and enzyme levels. (Author abstract by permission)

72-0084. Ishikawa, T.; Uono, M.; Segawa, M. (Ophthalmology Dept., Kitasato U., Japan). **Eye diseases caused by organiphosphorus compounds used in agriculture.** *Naika 27(5): 882-6; 1971.* (9 references) (Japanese)

The Saku area of Nagano Prefecture is known for the production of rice and fruits. The local inhabitants have been exposed to organophosphate insecticides which are being used extensively. There have been cases of optic nueritis among the children in this area and consequently 100 randomly selected schoolchildren from the ages of 8 to 9 years were examined ophthalmologically. Among these children, 5 to 7% of them were found to have abnormal ocular symptoms. Twenty-five adult patients who came for the treatment of autonomic nervous disorders together with ophthalmological symptoms were studied and found that all had been engaged in insecticide spraying operations in the field. All but one had a decreased level of serum cholinesterase. Among the children who had been treated at a local clinic, major complaints were optic neutritis, decreased visual fields, poor vision, and astigmatism. Their occurrence was at its highest in the season when the pesticides were used most widely. The ciliary muscles, pupillary muscles and oculomotor and vasomotor systems were affected severely, whereas the sensory organs were relatively intact in these cases. Similar ophthalmic conditions were produced in experimental animals by a minute quantity of organophosphates. The authors conclude that the ocular anomalies, either clinically diagnosed or still subclinical, were due to cholinesterase inhibitors.

72-0085. Kwalick, D. S. (Community Study on Pesticides, State Health Dept., Trenton, NJ 08608). **Physicians' pesticide primer.** *J. Med. Soc. New Jersey 68(5): 375-7; 1971.* (8 references)

The New Jersey Community Study on Pesticides, jointly sponsored by the Federal Food and Drug Administration and the State Health Department, is described. The purpose of the project is to study the effects of long-term, low-level exposure to pesticides. To this end, 200 occupationally exposed individuals and 50 controls are being studied. Thus far, no chronic biochemical abnormalities have been found in the exposed group. A comparison of 40 control with 52 exposed individuals revealed a statistically significant difference in the number of individuals with hearing and eye problems, chronic cough and sinusitis, dizziness and headaches and hypertension. The exposed individuals have been found to have higher serum residues of pesticides. The New Jersey State Health Department offers several services for confirmatory diagnosis in suspected pesticide poisoning cases. These include serum and red blood cell cholinesterase determination, analyses of serum, urine and gastric contents for various pesticides and their metabolites and analysis of unknown substances for pesticide content. In New Jersey, organophosphates have been involved in over 60% of the reported pesticide poisonings. A guide for estimating the lethal dose of poisonous substances, the relative toxicities of pesticides commonly used in New Jersey and the pharmacology, onset, signs and symptoms and treatment of acute pesticide poisoning are given in tables.

72-0086. Mozai, T.; Muro, T.; Yoshino, Y.; Shimada, Y. (Dept. of Internal Medicine, Tokyo U., Tokoyo, Japan). **Poisoning by agricultural chemicals.** *Naika 27(5): 870-81; 1971.* (104 references) (Japanese)

In spite of repeated warnings by government authorities,

the number of cases of accidental poisoning by chemicals used for agricultural purposes has not decreased appreciably according to the official statistics for the years 1963-1969. In 1969 alone, there were 187 cases of parathion poisoning and 197 cases of endrin poisoning among a total of 1430 poisoning cases reported. In organophosphate poisoning, a fatal dosage is considered to be 5 mg/kg or 250 to 300 mg in an adult. The toxic syndromes are considered to be caused by excess of acetylcholine and inhibition of the cholinesterase of the cholinergic nerves. For treatment, the administration of atropine in a massive dosage is recommended and artificial respiration is necessary for respiratory paralysis. The metabolic route of organochlorides has not been established yet but metabolites of DDT are known to deposite in the adipose tissue, while *gamma*-BHC is metabolized and excreted completely within 1 to 2 weeks. Their fatal oral dosages are 4 to 6 g with DDT in an oil solution, 20 to 30 g with DDT powder and 150 mg/kg with *gamma*-BHC. Organic mercury poisoning is mainly limited to neurological symptoms, sometimes mimicking encephalitis. There is no effective chemotherapy once pathological changes have taken place in the central nervous system. Apart from acute intoxication, clinicians should be reminded that there are chronic forms of poisoning such as those caused by ingestion of fish from polluted water or fetal exposure in the mother who shows no obvious toxic manifestation. Organic fluorides *in vivo* form monofluoricitrate by combining with oxaloacetic acid, which inhibits aconitase activities and blocks the TCA cycle in the process of converting citric acid to isocitric acid resulting in disturbance of tissue respiration. Methods of diagnosis and therapy of acute poisoning by potent agricultural chemicals have been established but the chronic exposure to a minute quantity may easily escape accurate diagnosis and yet have grave consequences in the future.

72-0087. Savage, E. P.; Bagby, Jr., J. R.; Mounce L.; Williams, Jr., L. P.; Cholas, P. H.; Cholas, G. (Inst. of Rural Environmental Health, Colorado State U., Fort Collins, CO 80521). **Pesticide poisonings in rural Colorado.** *Rocky Mt. Med. J. 63(4): 29-33; 1971.* (8 references)

Reports of 14 cases of pesticide poisoning in rural Colorado from 1965 to 1970 are presented and discussed. The information was obtained during a survey of the records of 15 hospitals in 12 rural communities. Two cases, both involving parathion, were fatal. Parathion and Phosdrin (mevinphos) accounted for 50% of the poisonings. Strychnine, Di-Syston (disulfoton), lindane, malathion, warfarin, unspecified organophosphates and unknown compounds were the agents in the remaining cases. The patients ranged in age from 18 months to 87 years; half of the cases were 17 years old or under. Pesticide exposure was related to occupation in eight cases. The accidents resulted from ignorance of or indifference to the hazards of the chemicals, improper storage, failure to use adequate protective clothing or inadequate supervision.

72-0088. Dinman, B. D. (Ann Arbor, MI 48106). **Organophosphate poisoning.** *J. Am. Med. Assoc. 217(11): 1553; 1971.*

The author, in a letter to the editor, addresses T. H. Milby's article, 'Prevention and management of organophosphate poisoning', in this journal (*216(13): 2131-3; 1971*; for an abstract see 71-2414). Milby stated that cyanosis in severe cases of organophosphate poisoning contraindicated atropine treatment until the cyanosis had been treated. The author contends that the time required to administer atropine does not sufficiently encroach upon the time required to treat cyanosis to warrant an absolute contraindication of immediate atropine treatment.

72-0089. Hayes, Jr., W.J. (The Center in Toxicology, Dept. of Biochemistry, Vanderbilt U. School of Medicine, Nashville, TN 37203). **Studies on exposure during the use of anticholinesterase pesticides.** *Bull. World Health Organ. 44(1-3): 277-88; 1971.* (48 references)

Relatively few studies have been made of the exposure of workers to pesticides. Of these, approximately half involved chlorinated hydrocarbon insecticides and most involved agricultural applications. Some important matters, especially indoor spraying--e.g., for malaria control--have been investigated experimentally with DDT only. Fortunately, information on exposure during agricultural use--which is of considerable interest in itself--can serve as a rough guide in connection with the exposures association with vector-control activities. This paper reviews the different methods of measuring exposure and the significance of some of the the results that have been obtained. (Author abstract)

72-0090. Namba, T. (Neuromulcular Disease Lab., Maimonides Medical Center, 4802 Tenth Ave., Brooklyn, NY 11219). **Cholinesterase inhibition by organophosphorus compounds and its clinical effects.** *Bull. World Health Organ. 44(1-3): 389-307; 1971.* (99 references)

The clinical manifestations of acute poisoning by organophosphorus compounds in man are in accord with, initially, the stimulation and, later, the blocking of cholinergic transmission due to acetylcholinesterase inhibition. The manifestations involve mainly the parasympathetic nerves, the neuromuscular junctions and the central nerve synapses and, to a smaller degree, the cholinergic sympathetic nerves. Miosis and muscle fasciculations are useful signs for diagnosis and for the control of therapy. Blood cholinesterase determination is the best diagnostic test. The cause of death is usually respiratory paralysis. Persistent manifestations have not been confirmed. Atropine and pralidoxime are effective for treatment and useful for diagnosis. Other oximes are promising but their clinical value has not been established. Poisoning by malathion is characterized by a prolonged course and by motor signs. Poisoning by organophosphorus compounds in man differs

from animal experiments in several ways: in man, exposure may occur by several different routes, the manifestations are detected more easily and therapy is given throughout the course of illness. (Author abstract)

72-0091. Ribelin, W. E. (Madison, WI 54301). **Comment on malathion poisoning.** *Arch. Environ. Health 23(4): 317; 1971.*

The author replies to 'Malathion Poisoning' by T. Namba *et al.* published in this journal, *21(4): 533-41; 1970* (for an abstract see 70-2160). The authors described a patient who had ingested 50 to 76 g of xylene in which 60 to 90 g of malathion was dissolved. They also stated that 'the toxicity of xylene is considerably less than that of malathion,' but gave LD50 values of 1000 to 1375 mg/kg for malathion and 7.71 mg/kg for xylene in the rat. It is fallacious to attribute death to an agent which is 1/154th as toxic as its solvent. (Note: The toxicity of xylene was misstated in the cited article. On p. 537 'mg' should read 'ml.' Thus, 'the LD50 of *m*-xylene in the rat is 7.71 ml/kg'.)

72-0092. Johnson, J. E. (Dow Chemical Co., Midland, MI 48640). **The public health implications of widespread use of the phenoxy herbicides and picloram.** *BioScience 21(17): 899-905; 1971.* (13 references)

The author reviews published research on the toxicity and chemistry of 2,4-D, 2,4,5-T, silvex and picloram and the extent to which humans are exposed to these compounds in air, food and water. He concludes that the widespread use of the phenoxy herbicides has not resulted in any demonstrable evidence of their potential harm to humans. The most widely used of the compounds, 2.4-D and 2,4,5-T, are readily degraded and do not concentrate in tissues. Man is not exposed to harmful levels in food, water or air. Toxicity studies have shown that the compounds are well tolerated in a variety of systems. Although chlorodibenzo-*p*-dioxin impurities could be a potential health problem, their presence in herbicides can be controlled by proper manufacturing techniques.

720093. Sandi, E. (Food Advisory Bur., Ottawa, Ontario, Canada). **Accidental poisoning with malathion.** *Brit. Med. J. 3(5775): 643; 1971.*

A letter-to-the-editor comments on F. H. Ekin's earlier note on malathion poisoning (this journal, *3(5765): 47; 1971*; for an abstract see 71-2149). The correct pediatric dosage in organophosphate insecticide poisoning should be 1 to 2 mg atropine i.v. or i.m. every 10 to 15 min until atropinization appears. Ekin's case history of the child poisoned by malathion and treated with 0.03 mg atropine s.c. at 10-min intervals must be a typographical error; it could lead to serious mistakes.

72-0094. Sears, H. S.; Meehan, W. R. (National Marine Fisheries Ser. Biological Lab., Auke Bay, AK 98821). **Short-term effects of 2,4-D on aquatic organisms in the Nakwasina River watershed, southeastern Alaska.** *Pesticides Monit. J. 5(2): 213-7; 1971.* (5 references)

Approximately 400 acres of cutover land on the Nakwasina River watershed in southeastern Alaska were treated with 2,4-D to inhibit the growth of broad-leaved plants. No immediate mortality to salmonid fishes or aquatic invertebrates was attributable to the spray. Samples of water and fish had concentrations of 2,4-D well below the level generally considered to be lethal to aquatic organisms. The results were considered inconclusive because of the lack of information on the pretreatment condition of the test animals. Further research is required to assess the immediate and long-term effects of these spray operations in Alaska. (Author abstract by permission)

72-0095. Reich, G. A. (Poison Control Center, Environmental Protection Agency, Chamblee, GA 30341). **Pesticide poisoning calls for fast action, eye for symptoms.** *Med World News 12(35): 41, 43-4; 1971.*

The author answers questions posed by the editors of this journal about the treatment of pesticide poisoning. The key to successful treatment in acute poisoning cases is rapid diagnosis of the symptoms when the agent is unknown. The physical can begin with the assumption that an organophosphate is involved because these are widely used in household pesticide formulations. A blood cholinesterase test is helpful in confirming organophosphate poisoning. Unlike the organophosphates, the organochlorines do not produce sweating, secretions from the nose and mouth or pin-point pupils. The organochlorines produce vomiting, paresthesias, tremors and convulsions. In cases of organophosphate poisoning, oxygen should first be provided, if needed. The patient's airway must be kept open. Then atropine (1 to 2 mg for children; 2 to 4 mg for adults) should be injected i.v. Slow injection or drip infusion of pralidoxime chloride helps overcome muscular weakness and helps restore voluntary breathing. If the patient does not respond to atropine within a minute or so, the poison is unlikely to be an organophosphate; the physician is then probably faced with a classic case of belladonna alkaloid poisoning. In the case of carbamate poisoning, atropine, but not pralidoxime chloride, should be used. When the agent is an organochlorine, an airway should be established. The patient must be kept going through treatment of the symptoms to give the body time to metabolize the poison. Pentobarbital can be used to control convulsions, but epinphrine is contraindicated.

72-0096. Teitelbaum, D. T. (Denver, CO 80901). **Organophosphate poisoning.** *J. Am. Med. Assoc. 217(12): 1704; 1971.*

In a comment on organophosphate poisoning in a letter-to-the-editor, the importance of organophosphorus pesticides in suicide and intentional overdosage is stressed. The author reports three extremely severe intentional suicidal ingestions of malathion in the last year. All three patients survived through vigorous decontamination and massive pralidoxime and atropine dosages. In a comment on T. H. Milby's article (this journal, *216(13): 2131-3; 1971*; for an abstract see 71-2414) re: adequate atropinization, the author states that in

his experience the single most useful sign of this state in acute anticholinesterase poisoning is cessation of the oral and tracheal secretions. That is the ultimate goal to be sought in atropine therapy and it should be kept in mind when the drug is administered.

72-0097. Khandekar, J. D. (Montreal, Canada). **Organophosphate poisoning.** *J. Am. Med. Assoc. 217(13): 1864; 1971.* (3 references)

In a letter-to-the-editor, the author states his surprise at finding no discussion of 'delayed deaths' in 'Prevention and management of organophosphate poisoning' by Milby, published in this journal, *216(13): 2131-3; 1971* (for an abstract see 71-2414). His own studies indicate that the condition of the patient poisoned with organophosphorus compounds may suddenly deteriorate and culminate in death after initial improvement. Patients should be treated in intensive care units with ECG monitoring and be kept under continuous observation even after initial improvement. In a study of 35 patients who ingested malathion in suicide attempts, 37% had electrocardiographic abnormalities such as dysrhythmia, right axis deviation and ST-T changes. The myocardium of five patients who died exhibited fatty metamorphosis, interstitial edema and infiltration by mononuclear cells. Alterations in the myocardium can cause delayed death.

72-0098. Eyl, T. B. (St. Clair, MI 48079). **Methyl mercury poisoning in fish and human beings.** *Clin. Toxicol. 4(2): 291-6; 1971.*

The potential consequences of environmental contamination by methyl mercury are reviewed in an editorial. The topics discussed include the methylation of inorganic mercury, the effects of methyl mercury in humans, the Japanese experience with methyl mercury poisoning and residues in fish and humans. This article is reprinted from a 1970 issue of *Mod. Med.*

72-0099. Wood, W.; Gabica, J.; Brown, H. W.; Watson, M.; Benson, W. W. (Dept. of Health, State of Idaho, Boise, ID 83701). **Implication of organophosphate pesticide poisoning in the plane crash of a duster pilot.** *Aerospace Med. 42(10): 1111-3; 1971.* (4 references)

The current emphasis on ecological awareness has resulted in greater concern being given to the environmental consequences of pesticide use. When considering direct human vulnerability to pesticides, one important category of highly exposed persons that deserves considerable attention is that of the aerial spray pilot. This report concerns a 34-year-old white male duster pilot with 10 years' flying experience and 6 years' aerial application experience, who crashed a Piper Pawnee 235 aircraft at 10:05 PM on June 22, 1969, while executing a routine landing maneuver. (Author abstract)

72-0100. Kreitzer, J. F. (Patuxent Wildlife Res. Center, Laurel, MD 20810). **Eggshell thickness in mourning dove populations.** *J. Wildlife Management 35(3): 563-4; 1971.* (6 references)

There was a small, steady decline in mourning dove (*Zenaidura macroura*) populations in the United States between 1960 and 1970. An a preliminary step to determining if environmental contaminants such as DDT and dieldrin might account for the decline, 452 mourning dove eggs were collected from nine states in 1969 and 11 states in 1970. The eggshell thickness were measured and compared with those of 97 eggs collected from 24 states be between 1861 and 1935 and stored in a museum. There were no significant differences among the eggshells except that those collected in Arizona and Louisiana in 1969, but not in 1970, were significantly thinner. It is concluded that eggshell thinning is not a factor in the decline of mourning dove populations.

72-0101. De Hamel, F. A. (U. of Otago, Dunedin, New Zealand). **Handling of 'DDT substitutes.'** *New Zealand J. Agr. 121(5): 21-4; 1970.*

The organophosphate pesticides are much more toxic to man than the organochlorine compounds they are replacing. Because they are easily absorbed through the skin, special precautions must be taken in handling them. Always wear rubber gloves, impervious overalls and a face mask. If the chemicals accidently get on the clothes, hair or skin, wash immediately with soap and water and change clothes. Always work upwind when the chemicals are being applied. Never eat or smoke during or after the use of the compounds; wash thoroughly first. Always read and follow the directions on the pesticide container. Keep the chemicals and empty containers out of the reach of children. Never reuse empty containers. If accidental poisoning occurs, call a doctor and take one 0.625-mg atropine tablet every 15 min for 1 hr and then every 30 min until medical help arrives.

72-0102. Clyne, R. M. (American Cyanimid Co., Wayne, NJ 07470). **Treatment of organophosphate poisoning.** *J. Occupational Med. 13(6): 310; 1971.*

In a letter-to-the-editor, the author replies to 'Treatment of poisoning by specific poisonings' [sic] by J.S. Tobin, published in this journal, *13(1): 22-5; 1971* (for an abstract see 71-1394). According to the author, Tobin left the impression that pralidoxime should be routinely used in treating organophosphate poisoning. While there is no doubt that it is effective against certain compounds (e.g; parathion), there is no evidence that it is effective against a number of organophosphates. Contrary to Tobin's opinion, the treatment of cyanosis in organophosphate poisoning cases should never take precedence over the immediate administration of atropine.

72-0103. Pasi, A.; Hine, C. H. (Toxicology Activity, Dept. of Pharmacology, U. of California School of Medicine, San Francisco, CA 94122). **Paraguat poisoning.** *Proc. Western Pharmacol. Soc. 14: 169-72; 1971.*

A nonfatal case of paraquat poisoning is described. A 49-year-old man swallowed at least 10 ml of a 42% paraquat

solution in an attempted suicide. Intense buccal, oral, pharyngeal and substernal burning followed and persisted for 2 weeks. Nausea, vomiting and diarrhea appeared transiently on the second day. On the third day, at which time the patient sought medical treatment, superficial ulcerations appeared in the mouth and pharynx. From the fourth to sixth days, urine flow was about 1 cup. An elevated BUN of 100 mg% and creatinine of 10.6 mg% were indicated by clinical chemistries. The patient was admitted to the hospital on the seventh day. Urine flow was then normal. Urinalysis revealed moderate proteinuria and glucosuria. The sediment contained coarse granular and hyaline casts. The urinary paraquat concentration was 1.75 mg%. In the following days, BUN and serum creatinine increased further. Creatinine clearance decreased to 27 ml/min on the ninth day. The patient was administered normal saline, dextrose 5% and mannitol i.v. to maintain a urine flow of 100 to 200 ml/hr. The urinary excretion of paraquat reached a maximum of 4 mg%/day on the 11th day. BUN, serum creatinine and creatinine clearance returned to normal. Peritoneal dialysis failed to remove paraquat from the blood. On the tenth day, discrete, patchy infiltrates were observed at the lung base. On the 12th day, the patient developed slight, fine, inspiratory crepitations. By the end of the third week, the lungs were normal and the lesions in the mouth and pharnyx had disappeared. At discharge, 0.24 mg% of paraquat was being excreted in the urine.

72-0104. Christensen, E. K. J.; Huizinga, T. (Apotheek Algemeen Provinciaal, Stadsen Academisch Ziekenhuis, Oostersingel 59, Groningen, The Netherlands). **Een methyleenchloride-intoxicatie met letale afloop. [A methylene chloride intoxication with fatal outcome.]** *Pharm. Weekblad 106: 301-5; 1971.* (Dutch)

In a case of a fatal methylene chloride intoxication, the autopsy observations were in correspondence with those in the available data from the literature and could well be explained by the toxic action of methylene chloride. It was possible to demonstrate methylene chloride with chromatographic methods in the blood, brain and lung tissue. (Author abstract edited)

See also **72-0003** **72-0004** **72-0008** **72-0012** **72-0015** **72-0019** **72-0022** **72-0024** **72-0025** **72-0061** **72-0072** **72-0073** **72-0138** **72-0139** **72-0143** **72-0145** **72-0167** **72-0183** **72-0192** **72-0196** **72-0217**

72-0105. Fabacher, D.L.; Chambers, H. (Dept. of Entomology, Mississippi State U., State College, MS 39762). **A possible mechanism of insecticide resistance in mosquitofish.** *Bull. Environ. Contam. Toxicol. 6(4): 372-6; 1971.* (10 references)

The results of a comparative study of the lipid content of insecticide resistance and susceptible mosquitofish *(Gambusia affinis)* and of the relation of lipid content to the survival of endrin-treated, susceptible mosquitofish are reported. The respective percentage lipid contents of resistant, "removal-resistant" and susceptible fish were as follows: in whole bodies–16.9, 11.7 and 9.4; in livers–25.7, 16.9, and 15.1; and in brains–26.8, 25.0 and 25.3. Susceptible mosquitofish were exposed to endrin at 20, 30 or 40 ppb under static conditions. Dead and living fish were analyzed for lipid content at 6, 12, 24 and 30 hr postexposure. The respective percentage lipid contents of dead and alive fish were as follows: 40 ppb (6 hr)–10.4 and 15.7; 20 ppb (12 hr)–12.2 and 15.3; 20 ppb (24 hr)–13.3 and 16.2; and 30 ppb (30 hr)12.2 and 15.8. It is suggested that the high lipid levels in the resistant and surviving, endrin-treated fish protect the organisms from the toxic effects of organochlorine compounds. Lipid content is perhaps genetically controlled. Other laboratory studies (unreported) suggest that organochlorine residues in water induce lipid deposition in susceptible mosquitofish.

72-0106. Getzin, L.W.; Rosefield, I. (Western Washington Res. and Ext. Center, Washington State U., Puyallup, WA 98371). **Partial purification and properties of a soil enzyme that degrades the insecticide malathion.** *Biochim. Biophys. Acta 235(3): 442-53; 1971.* (14 references)

An unusually stable esterase which catalyzed the hydrolysis of malathion to its monoacid was extracted from irradiation-sterilized soil and nonirradiated soil with 0.2 M sodium hydroxide and partially purified by manganous chloride treatment, ammonium sulfate precipitation, dialysis and ion-exchange chromatography. A 240-g sample of Chehalis clay loam yielded 28 mg of the final preparation. It contained 9.8 mg of protein and hydrolyzed 31 mcmoles of malathion in 4 hr at pH 7.0 and 37 degrees. Lineweaver-Burk plots obtained for two concentrations of the enzyme gave identical *Km* values of 0.000212 M. The enzyme was optimally active around pH 7.0. The enzyme was very stable, being denatured only at temperatures above 70 degrees and by 24 hr exposures at a pH less than 2.0 and a pH greater than 10.0. Lyophilization partially destroyed the activity but no loss of activity occurred during the extended storage of enzyme solutions at 4 degrees or frozen at -10 degrees. When the partially purified enzyme was applied to soil, activity was detected for the duration of the experimental period (8 weeks). Its existence as a stable, cell-free soil enzyme is postulated from experimental evidence based on the persistence and adsorptive characteristics of the partially purified enzyme in soil. This esterase should be an excellent tool for investigating enzymatic biological transformations in soil. (Journal abstract by permission)

72-0107. Gaur, A.C.; Bardiya, M.C. (Div. of Microbiology, I.A.R.I., New Delhi 12, India). **The effect of lindane and dieldrin on soil microbial population.** *Indian. J. Microbiol. 10(2): 33-98; 1970.* (17 references)

Soil samples were incubated up to 40 days with 0, 1, 10, 25, 100 or 1000 ppm of lindane or dieldrin. Bacteria, fungi and *Azotobacter* in the samples were counted at various intervals. The 100- and 1000-ppm treatments significantly reduced the total bacterial count on the seventh day. The bacterial count increased on the 28th day in samples treated with 25 ppm or more of lindane and with 1000 ppm dieldrin. Both insecticides drastically reduced the number of fungi for up to 2 weeks. Later reductions were not significant. The higher doses of lindane significantly reduced the *Azotobacter* count on the 14th day; dieldrin did not significantly affect the *Azotobacter* population.

72-0108. Casterline, Jr., J.L.; Brodie, R.E.; Sobotka, T. (Div. of Pesticide Chemistry and Toxicology, Bur. of Foods, Food and Drug Admin., Washington, DC 20204). **Effect of Banol and parathion on operant learning behavior of rats fed adequate and inadequate casein diets.** *Bull. Environ. Contam. Toxicol. 6(4): 297-303; 1971.* (9 references)

The effects of Banol (6-chloro-3,4-xylyl methylcarbamate), parathion and protein intake on learning behavior and on the activity of cholinesterase (ChE) and monoamine oxidase (MAO) in the brain were studied in experiments with male Osborne-Mendel rats. Groups of rats were fed diets containing 5 or 18% casein, with and without 1000 ppm Banol or 4 ppm parathion added. During the dietary treatment, the rats were subjected to daily 1-hr training sessions, 5 days a week, in a standard operant conditioning chamber. The ability of the rats to avoid a light and sound stimulus and electric shock by pressing a lever was recorded. After 9 weeks on the parathion diets or 10 weeks on the Banol diets, the rats were killed. The brains were removed and ChE and MAO activities were determined in the cerebellum and cerebrum. Parathion in the 5% casein diet retarded the learning ability of the rats and Banol in the 5% casein diet almost completely inhibited the lever-pressing response. The pesticides had no effect on the learning behavior of the rats fed the 18% casein diet. No pesticide-diet combination altered ChE or MAO activity.

72-0109. Nesynova, L.I.; Nesynov, Ye. P. (All-Union Res. Inst. of the Hygiene and Toxicology of Pesticides, Polymers and Plastics, Kiev, USSR). **Izuchenie vzaimodeistviya ATF s proizvodnymi ditiokarbaminovoy kisloty s pomoshch'yu IK i UF spektrov. [Study of the interaction of ATP with dithiocarbamic acid derivatives using IR and UV spectra.]** *Vopr. Med. Khim. 17(3): 311-5; 1971.* (10 references) (Russian)

The interaction of ATP with derivatives of dithiocarbamic acid leads to the formation of complexes which is confirmed by IR and UV spectra. A change in the intensity and a shift in the bands of the C=N bond (1700 to 1660/cm), of the adenine ring, the phosphate bonds P–O–P (920 to 910/cm) and the occurrence of new bands at 530, 515, 475/cm, etc. testify to the fact that in the formation of the complex, not only do the phosphate groups participate but so also does the adenine ring of ATP. According to the degree of change in the IR spectra of ATP from its interaction with the

indicated substances, the latter can be arranged in the following decreasing order: maneb, ziram and zineb. This corresponds to the accumulation of high-energy free nucleotides in the liver of rats under the influence of said pesticides. (Author abstract translated)

72-0110. Medovar, A.M. (All-Union Res. Inst. of the Hygiene and Toxicology of Pesticides, Polymers and Plastics, Kiev, USSR). **K obosnovaniyu dopustimykh ostatochnykh kolichestv sayfosa v produktakh pitaniya. [The establishment of permissible residues of Sayfos in nutritional products.]** *Vopr. Pitaniya 30(1): 51-5; 1971.* (17 references) (Russian)

Data are presented from a toxicological and hygienic evaluation of the organophosphorus pesticide Sayfos (O,O-dimethyl-S-(4,6-diamino-1,3,5-Triazinyl-2-methyl) dithiophosphate [menazon]). Sayfos possesses moderate acute toxicity for mice, is weakly cumulative and has an anticholinesterase action both in acute and in chronic experiments. The threshold dose in a chronic experiment with rats was 7 mg/kg; the subthreshold dose was 3.5 mg/kg. Based on the toxicological experiments and on hygienic studies into the actual contamination by Sayfos of food products, the permissible residue of Sayfos in vegetable food products was established as equal to 1 mg/kg. (Author abstract translated)

72-0111. Friedman, M.A.; Arnold, E.; Bishop, Y.; Epstein, S.S. (Lab. of Environmental Toxicology and Carcinogenesis, Children's Cancer Res. Foundation, Inc., 35 Binney St., Boston, MA 02115). **Additive and synergistic inhibition of mammalian microsomal enzyme functions by piperonyl butoxide, safrole and other methylenedioxyphenyl derivatives.** *Experientia 27(9): 1052-4; 1971.* (8 references)

Piperonyl butoxide, methylenedioxyaniline, methyl eugenol, safrole and vanillylamine exercise an additive inhibition of the function of microsomal enzymes in mice if they are given together in doses that are individually inactive. Piperonyl butoxide and safrole induce synergisticly the inhibition of aminopyrine demethylase activity. No synergistic inhibition resulted after combined treatment with piperonyl butoxide and high doses of structurally related, but inactive piperonylic acid. (Author abstract translated by permission of Birkhaeuser Verlag, Basel, Switzerland)

72-0112. Vonk, J.W.; Sijpesteijn, A.K. (Inst. for Organic Chemistry TNO, Utrecht, The Netherlands). **Methyl benzimidazol-2-ylcarbamate, the fungitoxic principle of thiophanate-methyl.** *Pesticide Sci. 2(4): 160-4; 1971.* (16 references)

A correlation was found between the formation of benzimidazol-2-ylcarbamate esters from the thiophanate fungicides (thiophanate, thiophanate-methyl and 2-(3-methoxycarbonylthioureido) aniline) and the fungitoxic activity of these fungicides. The fungitoxic activity of the thiophanates is increased by aging in aqueous media, while the fungitoxicity as well as the conversion rate decrease at lower pH. It is concluded that it is not the thiophanates themselves but the corresponding benzimidazol-2-ylcarbamate esters that are responsible for the fungitoxic effect. Hence, thiophanate-methyl, like benomyl, is a precursor of the fungitoxic agent, methyl benzimidazol-2-ylcarbamate (MBC). Indications were obtained that fungal metabolic activity can increase the rate of conversion of thiophanate-methyl into MBC. (Author abstract by permission)

72-0113. Bunyan, P.J.; Jennings, D.M.; Jones, F.J.S. (Pest Infestation Control Lab., Min. of Agriculture, Fisheries and Food, Tolworth, Surbiton, Surrey, England). **Organophosphorus poisoning: A comparative study of the toxicity of chlorfenvinphos (2-chloro-1-(2',4'-dichlorophenyl)vinyl diethyl phosphate) to the pigeon, the pheasant and the Japanese quail.** *Pesticide Sci. 2(4): 148-51; 1971.* (12 references)

The acute oral toxicity of chlorfenvinphos (2-chloro-1-(2',4'-dichlorophenyl)vinyl diethyl phosphate) was measured in the pigeon *(Columba livia),* pheasant *(Phasianus colchicus)* and quail *(Coturnix coturnix japonica)* and the compound was shown to be particularly toxic to pigeons. Additionally, all three species were fed chlorfenvinphos at 100 ppm in their diet for 2 or 4 weeks and esterase measurements were made by conventional and electrophoretic methods on extracts of liver, kidney and brain. The conventionally measured esterase inhibition correlated well with the acute oral toxicity figures. A more detailed study of the histochemically stained electrophoregrams showed some discrepancies compared with conventional methods but offered a possible explanation of the interspecies toxicity difference in that it revealed differential inhibition of some brain isoesterases in the pigeon but not in the pheasant or the quail. (Author abstract by permission)

72-0114. Cooke, A.S. (The Nature Conservancy, Monks Wood Exp. Station, Abbots Ripton, Huntingdon, England). **Uptake of DDT and DDE by the quail embryo and chick.** *Pesticide Sci. 2(4): 144-7; 1971.* (12 references)

Adult female Japanese quail *(Coturnix coturnix japonica)* were dosed orally with *p,p'*-DDT in order to produce residues of *p,p'*-DDT and *p,p'*-DDE in their eggs. The eggs were incubated and insecticide uptake by the developing embroys and chicks was compared with the results of other authors, who had injected chicken eggs with insecticide solution before incubation. The rate of uptake by quail embroys increased throughout the incubation period. At hatching and 2 days after hatching, the yolk sac was estimated to contain mean amounts of 37 and 7%, respectively, of the total residues in the chick. Quail eggs, without detectable organochlorine residues, were injected with either *p,p'*-DDT or *p,p'*-DDE in olive oil. At 6 days incubation, significantly more DDE than DDT was found in the embryo, but this trend had stopped by 10 days incubation. Metabolism of *p,p'*-DDT to *p,p'*-DDE was first detected after 9 days incubation. Embryonic development was slower in the injected eggs than in eggs from treated females. (Author abstract by permission)

72-0115. Walton, M.S.; Bastone, V.B.; Baron, R.L. (Div. of Pesticide Chemistry and Toxicology, Food and Drug Admin.,

Dept. of Health, Education and Welfare, Washington, DC 20204). **Subchronic toxicity of photodieldrin, a photodecomposition product of dieldrin.** *Toxicol. Appl. Pharmacol. 20(1): 82-8; 1971.* (10 references)

The subchronic toxicity of photodieldrin, a photodecomposition product of dieldrin which is found as a residue on certain agricultural commodities treated with dieldrin, was investigated in a 90-day feeding study in the rat. Comparison of the toxic potention of photodieldrin and dieldrin showed that, although photodieldrin was more acutely toxic, there were essentially no differences between the compounds in terms of the other parameters investigated. A slight, insignificant increase in liver weight at the lowest dose fed was the most notable effect produced by photodieldrin. Photodieldrin concentrated in the fat to a lesser extent than dieldrin. At the same dietary intake, the concentrations of dieldrin in the fat of males were four times and in females from five to ten times greater than the concentrations of photodieldrin. Increased cytochrome P-450 content and aniline hydroxylase activity were evident after the 90-day feeding of either compound at levels of 5 ppm and above. Because of similar subchronic effects, negligible quantities in food, decreased fat storage potential and rapid mobilization, it may be assumed that photodieldrin does not increase the toxicologic significance of dieldrin residues. (Author abstract by permission)

72-0116. Santolucito, J.A.; Whitcomb E. (Pharmacology Sect., Perrine Primate Res. Branch, Div. of Pesticide Chemistry and Toxicology, Bur. of Foods, Pesticides and Product Safety, Food and Drug Admin., Public Health Ser., Dept. of Health, Education and Welfare, P.O. Box 490, Perrine, FL 33157). **Mechanical response of skeletal muscle following oral administration of pesticides.** *Toxicol. Appl. Pharmacol. 20(1): 66-72; 1971.* (11 references)

Studies were made of the mechanical response characteristics of the soleus muscle, *in situ,* in rats orally dosed with a pesticide. The compounds tested and the doses administered were: carbaryl, 56 mg/kg; parathion, 1.8 mg/kg; *p,p'*-DDT, 50 mg/kg; and chlordane, 260 mg/kg. Two hr after administration of the calculated dose, the rat was anesthetized with sodium pentobarbital and the distal tendon of the right soleus muscle was freed from its insertion and attached to a force-displacement strain gauge transducer; stimulating electrodes were affixed to the sciatic nerve. The characteristics of performance measured were: stimulus frequency required (critical frequency) and tension developed for complete tetanus, frequency constants for tetanic contraction and relaxation and single contraction tension and duration. DDT treatment resulted in statistically significant reductions in tension of both the single twitch and complete tetanus contractions. Carbaryl increased the tensions developed during complete tetanus and decreased the time constant of tension development. Neither parathion nor chlordane altered any of the response characteristics at the doses tested. It is concluded that skeletal muscle mechanical behavior provides important criteria for the evaluation of the effects and mechanisms of action of pesticides in intact animals. (Author abstract by permission)

72-0117. Tucker, R.K.; Haegele, M.A. (U.S. Bur. of Sport Fisheries and Wildlife, Denver Wildlife Res. Center, Denver, CO 80225). **Comparative acute oral toxicity of pesticides to six species of birds.** *Toxicol. Appl. Pharmacol. 20(1): 57-65; 1971.* (13 references)

The acute oral LD50 values were determined for 16 common pesticides on mallard ducks *(Anas platyrhynchos),* ring-necked pheasants *(Phasianus colchicus),* chukar partridges *(Alectoris graeca),* coturnix quail *(Coturnix coturnix japonica),* common pigeons *(Columba livia)* and house sparrows *(Passer domesticus).* Analyses of the date revealed that: 1) the average sensitivity of any one species to the 16 pesticides did not differ statistically from that of any other species and 2) at the same time, the species varied widely in their sensitivity to any given compounds. The average range of the LD50 values for single chemicals in the six species was nearly tenfold. With differences of this magnitude, it is recommended that extrapolation of toxicity data from one species to another be avoided. (Author abstract by permission)

72-0118. Hansen, W.H.; Quaife, M.L.; Habermann, R.T.; Fitzhugh, O.G. (Bur. of Science, Food and Drug Admin., Washington, DC 20204). **Chronic toxicity of 2,4-dichlorophenoxyacetic acid in rats and dogs.** *Toxicol. Appl. Pharmacol. 20(1): 122-9; 1971.* (17 references)

Starting at 3 weeks of age, rats (25 female and 25 male/group) were fed for 2 years either 0, 5, 25, 125, 625 or 1250 ppm of 2,4-dichlorophenoxyacetic acid (2,4-D) in the diet. No significant effect on growth rate, survival rate, organ weights, or hematological values was noted. Total (male plus female) tumor incidence in the control and experimental groups was 15, 14, 18, 20, 23 and 22, respectively. No target organ tumors were observed; the individual tumor types were randomly and widely distributed and of the type normally found in aging Osborne-Mendel rats. Statistical analysis of the randomly distributed tumor types indicated a tendency for the proportion of females with tumors to increase with 2,4-D dosage and a trend toward dose-related increases in the proportion of males with malignant tumors. These tendencies do not reflect important pathologic differences. Groups of three male and three female beagle dogs each were fed 0, 10, 50, 100 or 500 ppm of 2,4-D in the diet for 2 years starting at 6 to 8 months of age. Twenty-eight dogs surviving the 2-year period were clinically normal and no 2,4-D-related effects were noted. One female at 100 ppm that was emaciated at autopsy at 2 years showed no significant lesions. Moderate depletion of cellular elements was noted at 10 ppm in one male that died after 10 months. In a three-generation, six litter rat reproduction study, no deleterious effect of dietary 2,4-D at 100 or 500 ppm was evident. At 1500 ppm, however, 2,4-D while apparently affecting neither fertility of either sex nor litter size, did sharply reduce the percent of pups born surviving to weaning and the weights of weanlings. (Author abstract by permission)

72-0119. Khunen, H. (Institut fuer Aerobiologie, Fraunhofergessellschaft zur Foerderung der Angewandten Forschung e.V., Grafschaft/Sauerland, Germany). **Activating and inhibitory**

effects of bispyridinium compounds on bovine red cell acetylcholinesterase. *Toxicol. Appl. Pharmacol. 20(1); 97-104; 1971.* (16 references)

The action of six bispyridinium compounds on the enzymatic activity of acetylcholinesterase has been investigated *in vitro*. The influence was either an activation or an inhibition of the enzyme, depending not only on the concentration of the antagonist, but also on that of the substrate. These compounds owe their activity mainly to their bisquaternary structure. The influence of substituents on the pyridine moiety is less important. It is assumed that binding of the bispyridinium compounds occurs not only on the active center, but also on another site of the enzyme. An interaction between these two binding sites is also postulated. The mechanism of inhibition is suggested to be a mixed competitive and noncompetitive one. (Author abstract by permission)

72-0120. Siegel, M.R. (Dept. of Plant Pathology, U. of Kentucky, Lexington, KY 40506). **Reactions of the fungicide folpet (N-(tricholormethylthio)-phthalimide) with a nonthiol protein.** *Pestic. Biochem. Physiol. 1(2): 234-40; 1971.* (22 references)

Alpha-chymotrypsin was used to investigate the reactions of folpet and its decomposition product, thiophosgene, with nonthiol proteins. Inhibition of the enzyme activity by both compounds was correlated with changes in the properties of the protein as determined by polyacrylamide gel electrophoresis. Binding studies using 14-C- and 35-S-folpet indicated that the intact fungicide complex(es) became unstable with time, however. The attachment of folpet to *alpha*-chymotrypsin, enzyme inhibition and changes in gel patterns of treated proteins appeared to be pH-dependent. These data suggest changes in the catalytically active conformation of treated protein. Possible reaction mechanisms involving folpet and thiophosgene with protein binding site(s) are discussed. (Author abstract)

72-0121. Yu, C.-C.; Kearns, C.W.; Metcalf, R.L.; Davies, J.D. (Dept. of Entomology, U. of Illinois at Urbana-Champaign, Urbana, IL 61801). **Acetylcholinesterase inhibition by biscarbamates.** *Pestic. Biochem. Physiol. 1(2): 241-7; 1971.* (8 references)

The inhibition and reactivation of acetylcholinesterase (AChE, EC 3.1.1.7) from the honey bee *(Aphis mellifera* L.), the house cricket *(Acheta Domestica* L.*)* and bovine erythrocytes by substituted phenyl biscarbamates were studied. AChE from different species shows remarkable species specificity toward these inhibitors. Biscarbamates with five methylene groups unexpectedly showed strong inhibition toward bee and cricket AChE. Preincubation of AChE with monocarbamates such as neostigmine prevents the inhibition by biscarbamates indicating that they involve the same esteratic site. The results of sucrose gradient centrifugation and reactivation studies indicate that only one end of the biscarbamate is carbamylated to an esteratic site of AChE. There is no evidence that two enzyme molecules are linked to a biscarbamate molecule. None of the bis-carbamates was appreciably toxic to insects. Using a dilution technique to study the reactivation rates showed that bovine erythrocyte AChE inhibited by these compounds reactivates much faster than insect AChE. (Author abstract)

72-0122. Hastings, F.L.; Dauterman, W.C. (USDA Forest Ser., Southeastern Forest Experiment Station Forestry Sciences Lab., Research Triangle Park, NC 27709). **Phosphorylation and affinity constants for the inhibition of acetylcholinesterase by dimethoxon analogs.** *Pestic. Biochem. Physiol. 1(2): 248-55; 1971.* (19 references)

Seventeen oxon analogs of dimethoate were prepared and the *in vitro* cholinesterase inhibition constants (K*a, k2* and *ki*) and *in vivo* toxicities to mice and houseflies determined. The *in vitro* cholinesterase inhibition studies indicated that monosubstitution on the carbamoyl nitrogen primarily affected reactivity *(k2),* whereas di-substitution affected affinity (K*a*). Modification of the O,O-dialkyl moiety had little effect on affinity, although reactivity increased proportionately with chain length. Conformational change in the enzyme surface was suggested as a possible explanation of these results. A distance of 2.7 to 4.7 Angstrom between the carbonyl carbon and phosphorus atoms of these inhibitors appeared to best satisfy the spatial requirements of acetylcholinesterase. While most of the compounds investigated were highly toxic to mice, only compounds which were N-mono-substituted showed insecticidal activity. There was no definite correlation between *in vivo* and *in vitro* studies. (Author abstract)

72-0123. Yamamoto, I.; Unai, T.; Ohkawa, H.; Caidsa, J.E. (Dept. of Agricultural Chemistry, Tokyo U. of Agriculture, Setagya-ku, Tokyo, Japan). **Stereochemical considerations in the formation and biological activity of the rotenone metabolites.** *Pestic. Biochem. Physiol. 1(2): 143-50; 1971.* (11 references)

The rotenone metabolites formed by enzymatic hydroxylation at one or more of the 12a-, 8'- or 6', 7'-positions are now available from synthesis. Co-chromatographic comparisons of these authentic compounds with the metabolites confirm that in addition to the hydroxylations in the 5'-isopropenyl side chain, the enzymatic attack at the B/C ring juncture introduces a hydroxyl group in the 12a *beta*- or 12a *alpha*-position with retention of the original stereochemical configuration at other positions. 5'-Hydroxyrotenone or its equivalent keto phenol and rotenolones derived from this material are not present as rotenone metabolites. The only metabolites with high potency as NADH oxidase inhibitors are those retaining the original 6a *beta*, 12a *beta*-configuration and with one hydroxyl group at the 12a *beta*- or 8'-position, but even these two metabolites are much less inhibitory than rotenone. The relatively high i.p. toxicity to mice of 6a *beta*, 12a *beta*-rotenolone and 8 -hydroxyrotenone despite their reduced activity as NADH oxidase inhibitors suggests that these compounds are not metabolically detoxified as rapidly as rotenone. (Author abstract)

72-0124. Deguchi, T.; Narahashi, T.; Haas, H.G. (Dept. of Physiology and Pharmacology, Duke U. Medical Center, Durham, NC 27710). **Mode of action of nereistoxin on the neuromuscular transmission in the frog.** *Pestic. Biochem. Physiol. 1(2): 196-204; 1971.* (29 references)

The effects of nereistoxin [one derivative, S,S'-[2-(dimethylamino)-trimethylene] thiocarbamate monohydrochloride (cartap) is a commercial insecticide] on the neuromuscular transmission of the frog have been studied by means of intracellular microelectrode and voltage clamp techniques. Nereistoxin blocked the neuromuscular transmission without causing depolarization of end-plate membranes. A small end-plate potential was elicited upon nerve stimulation. The frequency and amplitude of miniature end-plate potentials decreased after exposure to nereistoxin and the quantum content of the end-plate potential tended to decrease also. Chemical sensitivity of the end-plate membrane as examined by iontophoretic application of acetylcholine was markedly reduced. Both sodium and potassium ions are increased is the major action of nereistoxin responsible for neuromuscular blockade. (Author abstract edited)

72-0125. Mathre, D.E. (Dept. of Botany and Microbiology, Montana State U., Bozeman, MT 59715). **Mode of action of oxathiin systemic fungicides. III. Effect on mitochondrial activities.** *Pestic. Biochem. Physiol. 1(2): 216-24; 1971.* (34 references)

Carboxin (5,6-dihydro-2-methyl-1,4-oxathiin-3-carboxanilide) was tested for its effect on the activities of mitochondria from several fungi, pinto beans and rat liver. Succinate oxidation by mitochondria from the sensitive fungus *Ustilago maydis* was inhibited by low concentrations of carboxin, the K*i* being 0.31 mcM. The inhibition was of a noncompetitive nature. Succinate oxidation was also inhibited in the mitochondria from other sources but not to the extent as in those from *U. maydis*. Carboxin had little effect on the oxidation of NADH. The dioxide of carboxin, oxycarboxin, was not as effective in inhibiting succinate oxidation as was carboxin, but was more effective than the monoxide. Carboxin did not appear to uncouple oxidative phosphorylation in the presence of succinate in tightly coupled rat liver mitochondria but did decrease the respiratory control ratio. Carboxin was ineffective in releasing oligomycin inhibition in coupled rat liver mitochondria, while dinitrophenol and salicylanilide were effective in this respect. It is believed that carboxin inhibits mitochondrial respiration at or close to the site of succinate oxidation and does not greatly affect the remaining portion of the electron-transport system or the coupled phosphorylation reactions. (Author abstract)

72-0126. Siegel, M.R. (Dept. of Plant Pathology, U. of Kentucky, Lexington, KY 40506). **Reactions of the fungicide folpet (N-(trichloromethylthio)-phthalimide) with a thiol protein.** *Pestic. Biochem. Physiol. 1(2): 225-33; 1971.* (32 references)

The reaction of folpet with the enzyme glyceraldehyde 3-phosphate dehydrogenase (EC 1.2.1.12), from yeast, revealed a relationship between the number of protein sulfhydryls reacted with folpet and the loss of dehydrogenase activity. Folpet apparently reacts with both "essential" and "nonessential" sulfhydryls. Treatment of the enzyme with folpet and its decomposition product, thiophosgene, caused changes in absorbance profiles of the protein in polyacrylamide gel electrophoresis columns. These changes were associated with the inhibition of dehydrogenase activity and suggest an effect on tertiary configuration and/or denaturation of the protein. The presence of soluble thiols was shown to have an important function in the reaction of folpet with the enzyme. As much as 50% of the total folpet sulfur present was bound to the protein. A large percentage of this sulfur could be removed by the addition of excess soluble thiol. Under these conditions, a partial reversal of dehydrogenase inhibition and restoration of protein sulfhydryls occurred. Enzyme inhibition did not occur if dithiothreitol (*threo*-1,4-dimercapto-2, 3-butanediol) was added prior to the fungicide. The possible role of the low molecular-weight thiols in the reaction mechanisms of the fungicide with thiol proteins in cells is discussed. (Author abstract)

72-0127. Schulz, D. (Nedlitzer Strasse 3, 1 Berlin 31, Germany) **Durch das Herbizid Dowpon bedingte, lichtmikroskopische, biochemische und elektronenmikroskopische Veraenderungen am exokrinen Pankreas des Karpfen. [Light microscopic, biochemical and electron microscopic changes caused by the herbicide Dowpon in the exocrine pancreas of the carp.]** *Z. Angew. Zool. 58(1): 63-97; 1971.* (76 references) (German)

The side effects of the herbicide Dowpon (75% dalapon-Na) were studied in carp over a period of 28 days. A total of 112 first-year carp were placed in groups of four in 65-L pools to which 250 ppm of dalapon was added to group I, 25 ppm to group II and 2.5 ppm to group III. A test group without the herbicide was used as a control. Clinical observations showed a loss of appetite and suppressed behavior. In group I, the histological changes showed as acute necrosis of the pancreas and in group II as inflammatory changes with necrosis of individual cells. Group III showed acidophilic pancreatic exocrine cells with submicroscopical structures (granular endoplasmic reticulum) that had changed degeneratively. These changes were accompanied by slight inflammatory processes. In groups I and II, there was a significant decrease of RNA referred to the wetting weight.

72-0128. Neidzielska-Sosnierz, H. (Przychodna Lekarsko-Dentystyczna, ul. Podchorazych 3/5, Katowice, Poland). **Badania nad wplywen przedziorkofosu na blone sluzowa jamy ustnej i niektore narzady wewnetrzne szczura. [Study of the effect of przedziorkofos on the oral mucosa and certain internal organs of the rat.]** *Czas. Stomatol. 24(2): 133-40; 1971.* (35 references) (Polish)

Przedziorkofos (O,O-diethyl-2,5-dichlorophenylmercaptomethyl dithiophosphorane) belongs to the group of organophosphorus insecticides used for killing red spiders living on fruit trees and other plants. The 25% initial

product was used to prepare 1, 2, 3 and 4% emulsions (calculated for the active substance) and administered to rats in a single dose for 5 or 10 days either by swabbing the oral mucosa or by instilling the emulsion into the mouth. The dose used for these experiments was below the LD50 for rats or approached it. The animals were observed and pathological investigations were carried out after the observation. It was found that przedziorkofos penetrated the oral mucosa and exerted a general toxic effect. Instillation of the emulsion was more dangerous to the life of the animals than swabbing. No cumulation of the preparation was observed. The main pathological changes developed in the kidneys. The intensity of the changes in the other organs was low and they were reversible. (Journal abstract modified)

72-0129. Pekas, J.C. (Metabolism and Radiation Res. Lab., Animal Science Res. Div., ARS, U.S. Dept. of Agriculture, Fargo, ND 58102). **Intestinal metabolism and transport of naphthyl N-methylcarbamate** *in vitro* **(rat).** *Am. J. Physiol. 220(6): 2008-12; 1971.* (20 references)

(1-Naphthyl-1-14-C)N-methylcarbamate, an insecticide, was metabolized by the small intestine *in vitro*, forming water-soluble (nonextractable) metabolities. The primary metabolite was isolated and identified as naphthyl glucuronide. This metabolite was preferentially transferred to the serosal fluid of everted sacs to such an extent that the concentration of the metabolite in serosal fluid was several times greater than that in mucosal fluid after 120 min of incubation. Serosal-to-mucosal concentration ratios (S/M) up to 6:1 were measured. The synthesis of naphthyl glucuronide was apparently most effective in the cranial section, but transport was most effective in the caudal section. The requirement for and extent of active hydrolysis of the carbamate were not ascertainable since the parent carbamate partially decomposed in the pH 7.4 medium used, liberating free naphthol. Mucosal-to-serosal transfer of (naphthyl-1-14-C)N-methylcarbamate and free naphthol-14-C can be explained by passive equilibration. (Author abstract)

72-0130. Daevring, L.; Sunner, M. (Inst. of Genetics, U. of Lund, S-223 62, Lund, Sweden). **Cytogenic effects of 2,4,5-trichlorophenoxyacetic acid on oogenesis and early embryogenesis in** *Drosophilia melanogaster. Hereditas 68(1): 115-22; 1971.* (17 references)

Adult flies were exposed to 250 ppm of 2,4,5-T in their food within or later than 24 hr of eclosion. After a 5 to 6 day exposure, the females were decapitated, whereupon they deposited their mature eggs. The eggs and ovaries were then examined microscopically. Increased sterility was observed among the younger flies. The disturbances caused by 2,4,5-T began when the gonial cell, or germarcystoblast, divided and resulted in defective follicles. The younger flies (exposed when less than 24 hr of age) had no follicles in stages 8 to 14. The degenerated follicles of stages 9 and 10 resembled those caused by the sterility gene diminutive. The older flies had several well-advanced follicles that were apparently not affected by 2,4,5-T. Hence, sterile effects were not instantly observed. Photomicrographs of normal and abnormal cells are reproduced and the methodology of determining toxicities with *Drosophila* is discussed.

72-0131. Halmi, K.A.; Lascari, A.D. (Pediatric Dept., U. of Iowa Col. of Medicine, Iowa City, IA 52240). **Conversion of virilization to feminization in a young girl with adrenal cortical carcinoma.** *Cancer 27(4): 931-5; 1971.* (18 references)

The case history of a 4-year-old girl with virilizing adrenal cortical carcinoma is given. After surgical removal of the carcinoma, treatment with *o,p'*-DDD was begun. This therapy was intermittent and of varying dosage because of recurring toxic effects (nausea, vomiting, anorexia, headache, somnolence, confusion, dizziness, etc.) and adrenocortical insufficiency that required treatment with adrenal cortical steroids. Recurrences of the tumor and metastases to the lungs and liver were followed by raised 17-ketosteroid output and feminization. Despite removal of the tumor and hemihepatectomy, the girl died 3 years after the onset of illness. The change of the androgen- and 17-hydroxycorticoid-producing adrenal cortical carcinoma into one causing feminization may have been the result of biochemical changes in the tumor or of extraadrenal metabolism of the adrenal androgens to estrogens under the influence of DDD. The results of the autopsy are given.

72-0132. Hoffmann, D.; Wynder, E.L. (Div. of Environmental Toxicology, American Health Foundation, 2 East End Ave., New York, NY 10021). **A study of tobacco carcinogenesis. XI. Tumor initiators, tumor accelerators and tumor promoting activity of condensate fractions.** *Cancer 27(4): 848-64; 1971.* (45 references)

DDD, *o,p'*-DDD, DDT, *o,p'*-DDT, DDM, DDE and *trans*-4,4'-dichlorostilbene (DCS) were identified in tumor-initiating subfractions of tobacco smoke condensate. Other constituents of these subfractions were N-alkylcarbazoles and alkylated and unsubstituted fluoranthenes, benzofluorenes, cyclopentaphenanthrenes and pyrens. In laboratory experiments with albino mice, DCS was neither a complete carcinogen, tumor initiator N or tumor promoter. DCS (0.3%) significantly accelerated the tumorigenicity of a benzo[a]pyrene solution (0.003%) when both were concurrently applied to the backs of mice. This effect was not observed when 0.05% DCS was added to the mouse food.

72-0133. Yu, C.-C.; Booth, G. M. (Dept. of Entomology, 320 Morrill Hall, U. of Illinois at Urbana-Champaign, Urbana, IL 61801). **Inhibition of choline acetylase from the house fly** *(Musca domestica L.)* **and mouse.** *Life Sci. II 10(6): 337-47; 1971.* (17 references)

The effect of 31 compounds on the activity of choline acetylase (ChA) from housefly heads and mouse brains was assayed *in vitro* by the method of Schrier and Shuster (1967). The styrylpyridine analogs had no effect on fly ChA but inhibited mouse ChA. 3-Bromoacetonyltrimethylammonium bromide irreversibly inhibited both fly and mouse ChA, but replacing the trimethylammonium bromide group with tri-

ethylammonium bromide completely destroyed the inhibitory effects. The following compounds were more effective against mouse ChA activity than against fly ChA: *alpha*-bromoacetophenone, *alpha,p*-dibromoacetophenone and *alpha*-bromo-2'-acetonaphthone. The alkyl bromothiolacetates inhibited ChA, whereas ethyl thiolacetate was inactive. Iodoacetamide, ethyl bromoacetate, tetralkylammonium ions, substituted pyridium ions, DFP, DDT, 3,3-dimethylbutyl acetate and hemicholinium-3 were inactive against ChA. N,N-Dialkyl-2-phenyl-aziridinium ions partially inhibited fly ChA, but were inactive against mouse ChA. Fly and mouse ChA were inhibited to different degrees by *p*-hydroxyl mercuribenzoate. The structural formulas of the compounds and the results of the enzyme assays are given in a table. The toxicity of the compounds to female houseflies is discussed.

72-0134. Sheahan, B.J.; Pugh, D.M.; Winstanley, E.W. (School of Veterinary Medicine, U. of Dublin, Ballsbridge, Dublin, Ireland). **Experimental sodium chlorate poisoning in dogs.** *Res. Vet. Sci. 12(4): 387-9; 1971.* (13 references)

Methemoglobinemia, nephropathy and death occurred in one dog following the oral administration of 2 g/kg of sodium chlorate. An oral dose of 1 g/kg resulted in severe methemoglobinemia and the death of another dog with preexisting chronic interstitial nephritis. The presence of chlorate in the plasma and both chlorate and blood pigment in the urine were confirmatory features of the toxicosis in these and in three other dogs which survived doses of 0.5 g/kg (i.v.), 0.5 g/kg and 1 g/kg (oral), respectively. (Author abstract)

72-0135. Janicki, R.H.; Kinter, W.B. (Mount Desert Island Biological Lab., Salisbury Cove, ME 04672). **DDT: Disrupted osmoregulatory events in the intestine of the eel, *Anquilla rostrata*, adapted to seawater.** *Science 173(4002): 1146-8; 1971.* (30 references)

The drinking of seawater and the absorption of water along with sodium across the intestinal epithelium are well-known osmoregulatory events in marine teleosts. The insecticide DDT impairs fluid absorption in the intestinal sacs from eels adapted to seawater. Furthermore, this functional impairment has an enzymatic basis; DDT also inhibits the (Na+ and K+)-activated, Mg2+ -dependent adenosine triphosphatase in homogenates of the intestinal mucosa. Thus, the extreme sensitivity of teleosts to organochlorine pollutants may involve the disruption of osmoregulatory transport mechanisms. (Author abstract by permission, copyright 1971 by the American Association for the Advancement of Science)

72-0136. Aldridge, W.N. (Biochemical Mechanisms Sect., Toxicology Unit, Medical Res. Council Lab., Carshalton, Surrey, England). **The nature of the reaction of organophosphorus compounds and carbamates with esterases.** *Bull. World Health Organ. 44(1-3): 25-30; 1971.* (46 references)

This paper outlines our knowledge of the reaction of organophosphorus compounds and carbamates with esterases, examples of particular aspects of the reaction being confined to cholinesterases, although the general principles discussed apply to all B-esterases. Mathematical expressions are given for the different rate constants and some of the factors that may affect the response of insect and mammalian cholinesterases to organophosphorus compounds and carbamates are discussed. (Author abstract)

72-0137. Fukuto, T.R. (U. of California, Riverside, CA 92502). **Relationships between the structure of organophosphorus compounds and their activity as acetylcholinesterase inhibitors.** *Bull. World Health Organ. 44(1-3): 31-42; 1971.* (24 references)

The relation between chemical structure and inactivation of the enzyme acetylcholinesterase (AChE) by organophosphorus esters is discussed, in terms of reactivity and steric effects. The discussion is centered in organophosphorus esters of the type (R)(R')P(O)X, where X is a readily displaceable group and R and R' are various combinations of alkyl, alkoxy, alkylthio and amido moieties. Specific examples illustrating the effect of AChE inhibition on the selective toxicity of organophosphorus esters for insects and mammals are also presented. (Author abstract, edited)

72-0138. Holmstedt, B. (Dept. of Toxicology, Swedish Medical Res. Council, Karolinska Inst., Stockholm, Sweden) **Distribution and determination of cholinesterases in mammals.** *Bull. World Health Organ. 44(1-3): 99-107; 1971.* (18 references)

This paper reviews the distribution of cholinesterases in the central nervous system, the ganglia, the striated muscle and the blood of mammals and discusses the correlation between the histochemical localization and the function of neuronal cholinesterase. Different methods for the determination of cholinesterase levels are reviewed, with particular reference to their practical value for field work. The Warburg method and the tintometer and Acholest colorimetric methods are compared on the basis of cholinesterase levels determined in normal persons and in those suffering from parathion intoxication. (Author abstract)

72-0139. Reiner, E. (Inst. of Medical Res., Yugoslav Acad. of Science and Arts, Zagreb, Yugoslavia). **Spontaneous reactivation of phosphorylated and carbamylated cholinesterases.** *Bull. World Health Organ. 44(1-3): 109-12; 1971.* (20 references)

This paper presents, in tabular form, extensive data on the rates of spontaneous reactivation of phosphorylated and carbamylated cholinesterases from numerous animal species. The half-lives clearly indicate the influence of the acyl group of the inhibitor and that of the source of the enzyme. (Author abstract)

72-0140. Knaak, J.B. (Niagara Chemical Div., FMC Corp., Middleport, NY 14105). **Biological and nonbiological modifications of carbamates.** *Bull. World Health Organ. 44(1-3): 121-31; 1971.* (49 references)

Methylcarbamate insecticides undergo hydrolysis, oxida-

tion, dealkylation and conjugation in animals, plants and insects to form similar or identical products. Carbaryl is hydroxylated in biological systems to form hydroxy, dihydro-dihydroxy and N-hydroxymethyl carbaryl and is hydrolyzed to form 1-naphthol. The products are conjugated, stored or excreted. Carbofuran is hydroxylated at the 3-position and propoxur at the 5-position to form hydroxylated derivaties. N-hydroxymethyl derivatives of these two carbamates may also be formed. Hydrolysis appears to be the major metabolic pathway of carbofuran in the animal. Aldicarb is oxidized to its sulfoxide and then hydrolyzed to the oxime sulfoxide in animals and plants. Plants hydrolyze the oxime sulfoxide to form the corresponding aldehyde, which is an intermediate in the formation of 2-methyl-2-(methylsulfinyl)propanol. Methomyl, which is structurally similar to aldicarb, is metabolized in palnts to acetonitrile, carbon dioxide and methylamine. Bux and Meobal undergo hydrolysis and hydroxylation to form N-hydroxy methylcarbamates, as well as hydroxybutylphenyl and hydroxymethylphenyl methylcarbamates. Zectran, which contains a dimethylamino group, is converted to the methylamino, amino and methylformamido derivatives by insects and plants. In soil and water, methylcarbamate insecticides are hydrolyzed to their respective phenols or oximes. (Author abstract)

72-0141. Dauterman, W.C. (Dept. of Entomology, North Carolina State U., Raleigh, NC 27607). **Biological and nonbiological modifications of organophosphorus compounds.** *Bull. World Health Organ. 44(1-3): 133-50; 1971.* (129 references)

The general types of biological reaction that are most prominent in the modification of organophosphorus compounds involve the mixed-function oxidases, hydrolases, or transferases. In certain cases, more than one of these reactions may be involved at the same site on the pesticide molecule. Examples of various organophosphorus pesticides that are altered by oxidation, hydrolysis, alkyl or aryl group transfer, reduction and conjugation are discussed. The increase or decrease in toxicity of a pesticide that can result from biological modification is emphasized. Nonbiological transformations of organophosphorus compounds involve the effect on the compounds of such factors as light, air, temperature and the solvent. These factors are discussed with special emphasis on desulfuration, rearrangement and oxidation. (Author abstract)

72-0142. Hollingworth, R.M. (Dept. of Entomology, Purdue U., Lafayette, IN 46207). **Comparative metabolism and selectivity of organophosphate and carbamate insecticides.** *Bull. World Health Organ. 44(1-3): 155-70; 1971.* (113 references)

The comparative metabolism and toxicity of organophosphorus and carbamate insecticides are reviewed with the purpose of assessing our present ability to design new toxicants with improved selectivity. The occurrence of quantitative and qualitative differences in metabolism in vertebrates and insects is considered and an assessment is made of the role of metabolic activation and degradation in the complex interactions governing toxicity. (Author abstract)

72-0143. DuBois, K.P. (Toxicity Lab., U. of Chicago, Chicago, IL 60637). **The toxicity of organophosphorus compounds to mammals.** *Bull. World Health Organ. 44(1-3): 233-40; 1971.* (11 references)

The acute toxicity of most of the commonly used organophosphorus insecticides is essentially the same. A few compounds with low toxicity, such as malathion, have been developed but further efforts in that direction are needed. Most of the organophosphorus insecticides exert a generalized cholinergic action by inhibiting central and peripheral cholinesterases. The phosphoramides are an exception in that they do not gain access to the cholinesterase of the central nervous system *in vivo*, consequently atropine is a more effective antidote for them than for organophosphorus compounds. Young animals are more susceptible to the organophosphorus compounds than are adults. Enzyme-inducing agents decrease the toxicity of the phosphorothioates and phosphorodithioates. All organophosphorus insecticides can inhibit esterases that catalyze the detoxification of some insecticides of this class and ester-type drugs. (Author abstract)

72-0144. Vandekar, M.; Plestina, R.; Wilhelm, K. (Vector Biology and Control, World Health Organization, Geneva, Switzerland). **Toxicity of carbamates for mammals.** *Bull. World Health Organ. 44(1-3): 241-9; 1971.* (19 references)

Toxicity studies have been carried out with a number of monomethylcarbamates, most of which reached an advanced stage in the World Health Organization insecticide evaluation program. Both quantitative and qualitative distinctions have been found between the carbamates studies and certain common characteristics that distinguish them in several important aspects from organophosphorus insecticides have been demonstrated. (Author abstract)

72-0145. Meeter, E.; Wolthuis, O.L.; Benthem, R.M.J. van (Medical Biological Lab. TNO, Rijswijk Z.H., The Netherlands). **The anticholinesterase hypothermia in the rat: Its practical application in the study of the central effectiveness of oximes.** *Bull. World Health Organ. 44(1-3): 251-7; 1971.* (15 references)

Cholinesterase inhibitors that can pass the blood-brain barrier produce hypothermia when injected i.v. in just sublethal doses. From a comparison of the hypothermia-reducing effects of five cholinesterase-reactivating oximes when injected i.p. or subarachnoidally into rats pretreated with DFP or soman, it was possible to distinguish central and peripheral actions of the oximes. The comparative efficacy of the five oximes and the effectiveness of cholinesterase inhibitors in producting hypothermia in other animal species, including man, are discussed. (Author abstract)

72-1046. Aldridge. W.N.; Johnson, M.K. (Biochemical Mechanisms Sect., Toxicology Unit, Medical Res. Council Lab., Carshalton, Surrey, England). **Side effects of organophosphorus compounds: Delayed neurotoxicity.** *Bull. World Health Organ. 44(1-3): 159-63; 1971.* (16 references)

Many organophosphorus compounds produce a chronic

toxicity that has been classified as a dying-back process in which the long axons are particularly affected. Recent evidence indicates that an essential first step in the production of the lesion is the phosphorylation of a protein that is able to hydrolyze substrates such as phenyl phenylacetate. The esterase activity of the protein is inhibited by this phosphorylation, presumably at the active site. However, the toxic effect is related only to phosphorylation and not to the loss of esterase activity. (Author abstract)

72-0147. Donninger, C. (Milstead Lab. of Chemical Enzymology, Shell Res. Ltd., Sittingbourne, Kent, England). **Species specificity of phosphate triester anticholinesterases.** *Bull. World Health Organ. 44(1-3): 165-8; 1971.* (8 references)

Two widely distributed enzyme systems degrade phosphate triester anticholinesterase agents to inactive phosphate diesters by nonhydrolytic mechanisms. The substrate specificity of these enzymes is discussed and the level of activity in various mammalian livers is described. The distribution of these enzymes is an important factor in accounting for the species specificity of at least some anticholinesterase agents. (Author abstract)

72-0148. Narahashi, T. (Pharmacology Div., Dept. of Physiology and Pharmacology, Duke U. Medical Center, Durham, NC 27706). **Mode of action of pyrethroids.** *Bull. World Health Organ. 44(1-3): 337-45; 1971.* (26 references)

Since pyrethroids are potent neuropoisons, their mechanism of action on the nervous system can best be studied by means of electrophysiological techniques. The nerve excitation occurs as a result of changes in nerve membrane permeabilities to sodium and potassium ions and therefore any effect of pyrethroids can be interpreted in terms of such permeabilities. Detailed analyses of the action of allethrin on the giant axons of the cockroach, the crayfish and the squid performed by means of intracellular microelectrode and voltage clamp methods have revealed the ionic basis of the action of allethrin on the nerve. (Author abstract)

72-0149. Yamamoto, I.; Elliott, M.; Casida, J.E. (Div. of Entomology, U. of California, Berkeley, CA 94720). **The metabolic fate of pyrethrin I, pyrethrin II and allethrin.** *Bull. World Health Organ. 44(1-3): 247-8; 1971.*

By the administration of radioactively labeled compounds, the metabolic products of pyrethrin I, pyrethrin II and allethrin in the rat have been identified. This paper describes the structures of the metabolities. (Author abstract)

72-0150. Holan, G. (Div. of Applied Chemistry, CSIRO, Box 4331 G.P.O., Melbourne, Australia). **Rational design of insecticides.** *Bull. World Health Organ. 44(1-3): 355-62; 1971.* (11 references)

A steric model of diaryl insecticides, which includes the structure of DDT and its analogs, was used for the synthesis of new highly active insecticides. The new compounds show low toxicity to mammals and their insecticidal activity can be potentiated by microsomal oxidase inhibitors. There is evidence that they readily undergo biological degradation. However, a spontaneous controlled chemical degradation was also established for the diaryl oxetanes, which form one group of a new series of insecticides. The theoretical model was further investigated using X-ray crystallography to establish one accurate structure. Biologically, the model is supported by studies of the correlation between insect mortalities and temperature and by measurements of nerve impulses at fly chemoreceptors after treatment with selected compounds. (Author abstract)

72-0151. Metcalf, R.L.; Kapoor, I.P.; Hirwe, A.S. (U. of Illinois, Urbana-Champaign, IL 61820). **Biodegradable analogues of DDT.** *Bull. World Health Organ. 44(1-3): 363-74; 1971.* (24 references)

Despite the immense utility of DDT for vector control, its usefulness is prejudiced by its stability in the environment and by the low rate at which it can be degraded biologically. Metabolic studies in insects, in mice and in a model ecosystem with several food chains have shown that DDT analogs with substituent groups readily attacked by multifunction oxidases undergo a substantial degree of biological degradation and do not appear to be stored readily in animal tissues or concentrated in food chains. Detailed metabolic pathways have been worked out and it is clear that comparative biochemistry can be used to develop DDT analogs that are adequately persistent yet biodegradable. A number of new DDT analogs have been evaluated for insecticidal activity against flies and mosquitos and for their potential usefulness as safe, persistent and biodegradable insecticides. (Author abstract)

72-0152. Bitman, J.; Cecil, H.C.; Fries, G.F. (Animal Science Res. Div., Agricultural Res. Ser., Beltsville, MD 20705). **Nonconversion of *o,p'*-DDT to *p,p'*-DDT in rats, sheep, chickens and quail.** *Science 174 (4004): 64-6; 1971.* (10 references)

The finding of appreciable quantities of *p,p'*-DDT after feeding *o,p'*-DDT to rats led to the proposal of theory that an isomeric metabolic conversion occurs. The presence of *p,p'*-DDT as an impurity in supposedly pure samples of *o,p'*-DDT is the correct explanation for the appearance of *p,p*-DDT. Purified *o,p'*-DDT and 14-C-labeled *o,p'*-DDT yielded no data to support the idea that *o,p'*-DDT is converted to the *p,p'*-DDT isomer. (Author abstract by permission, copyright 1971 by the American Association for the Advancement of Science)

72-0153. Janicki, R.H.; Kinter, W.B. (Mt. Desert Island Biological Lab., Salisbury Cove, ME 04672). **DDT inhibits Na+, k+, Mg2+-ATPase in the intestinal mucosae and gills of marine teleosts.** *Nature New Biol. 233(30): 148-9; 1971.* (18 references)

Analytical grade *p,p'*-DDT (1 to 50 ppm) dissolved in 5% N,N-dimethylformamide (DMF) inhibited sodium-potassium-

activated, magnesium-dependent, adenosine triphosphatase (Na+, K+, Mg2+-ATPase) in incubation mixtures of intestinal mucosae and gills from several species of marine teleosts. AT a DDT concentration of 50 ppm, activity was inhibited about 40 and 50% in the mucosae of the winter flounder *(Pseudopleuronectes americanus)* and the king O'Norway *(Hemitripterus americanus)*, respectively. The relation of DDT concentration to enzyme inhibition was linear. at 50 ppm DDT, enzyme inhibition was 37% in yellow tail flounder *(Limanda ferruginea)* mucosa and 35% in long-horned sculpin *(Myoxocephalus octodecimspinosus)* mucosa. Mg2+-ATPase in these species and Na+, K+, Mg2+-ATPase in the mackerel *(Scomber scombrus)* were unaffected by DDT. In the gills of *P. americanus*, 50 ppm DDT inhibited 54% of Na+, K+, Mg2+-ATPase activity and 25% of Mg2+-ATPase activity. Several organic solvents (5% concentration) of DDT were also found to be inhibitors of enzyme activity in the mucosa of *P. americanus*, as follows: DMF, 3%; Dimethyl sulfoxide, 19%; acetone, 33%; ethanol, 34%; and cyclohexanone, 100%.

72-0154. Lucier, G.W.; McDaniel, O.S.; Matthews, H.B. (National Inst. of Environmental Health Sciences, Dept. of Health, Education and Welfare, P.O. Box 12233, Research Triangle Park, NC 27709). **Microsomal rat liver UDP glucuronyltransferase: Effects of piperonyl butoxide and other factors on enzyme activity.** *Arch. Biochem. Biophys. 145(2): 520-30; 1971.* (30 references)

Activation of rat liver microsomal UDP glucuronyltransferase by detergent or aging was not accompanied by a change in K*m* for 1-naphthol or UDPGA. Divalent cations (Mg2+, Mn2+ and Co2+) stimulated glucuronic acid conjugation of 1-naphthol and *p*-nitrophenol in both unactivated and activated microsomes; however, Zn2+ strongly inhibited UDP glucuronyltransferase. A total activation factor of 30-fold resulted when both Triton X-100 and magnesium chloride were added to the incubation medium. Triton X-100 and magnesium chloride also stimulated UDP glucuronyltransferase from rabbit liver microsomes with a total activation factor of 20-fold. The UDP glucuronyltransferases conjugating 1-naphthol, testosterone and a dieldrin metabolite were inhibited *in vitro* by insecticide synergist chemicals. Piperonyl butoxide had *I50* values of 0.0000073 and 0.000090 M for testosterone and 1-naphthol glucuronyltransferase, respectively. Inhibition of the enzyme from detergent-activated microsomes was considerably less than that of the enzyme from unactivated or aged microsomes. Pretreatment of male or female rats with piperonyl butoxide for 3 days resulted in a twofold induction of the UDP glucuronyltransferase conjugating 1-naphthol and *p*-nitrophenol. 1-Naphthol and *p*-nitrophenol were shown to be glucuronidated by the same enzyme by analysis of the mixed substrate method, divalent cation requirements, activation by detergent or aging, submicrosomal distributions, levels of induction by piperonyl butoxide and gravitational studies. This work was greatly facilitated by the use of a new, rapid and sensitive radioassay for UDP glucuronyltransferase which is described here. (Author abstract)

72-0155. Gladenko, V.I. (Dept. of Medical Parasitology, Ukrainian Inst. of Postgraduate Training for Doctors, Kharkov, USSR). **Izucheniye toksichnosti tiabendazola. [Study of the toxicity of thiabendazole.]** *Farmakol. i Toksikol. 34(4): 483-5; 1971.* (12 references) (Russian)

The LD50 for an aqueous suspension of Thiabenzadole administered to the stomachs of fasting white mice (15-18 g) was 1395 mg/kg. Doses up to 825 mg/kg did not cause any pathological changes in the internal organs of the mice. Some of the animals administered 1950 mg/kg showed fatty degeneration of the liver, a decrease in the number of Malpighian bodies in the spleen, and a diffuse, desquamative-necrotic catarrh in the small intestine. (Author abstract translated and modified)

72-0156. Tarakhovskiy, M.L.; Timoshenko, Ya. G. (Exptl. Sect., Hero of the Soviet Union P.M. Buiko, Kiev Res. Inst. of Pediatrics, Obstetrics and Gynecology, Kiev, USSR). **O prirode vzaimodeystviya antikholinesteraznykh sredstv s allo- i izostericheskimi uchastkami kholinoretseptorov. [The nature of the interaction of anticholinesterase substances with the allo- and isosteric portions of cholinoreceptors.]** *Byul. Eksperim. Biol. i Med. 72(7): 48-51; 1971.* (31 references) (Russian)

In the presence of nonanticholinesterase concentrations of proserine and myotol, the bologram of logarithms of the concentration-acetylcholine effect significantly shifted to the left on the scale of concentrations parallel to the initial value. Cadmium chloride (0.000001 M) removed this shift. With an increase in the concentration of cadmium chloride to 0.0001 M, the curve of the logarithms of the concentration-acetylcholine effect shifted to the right parallel to the bologram obtained in the absence of cadmium chloride; the contractile reaction of the intestine to myotol was absent. (Author abstract translated)

72-0157. Mamyan, D.B. (Lab. of Nutritional Hygiene, Inst. of Epidemiology and Hygiene, Acad. of Sciences of the Armenian SSR, Erivan, Armenian SSR, USSR). **Toksikologicheskaya otsenka gerbitsida 243 (soobshcheniye 1-oye). [Toxicological evaluation of the herbicide 243 (report No. 1).]** *Zh. Eksper. Klin. Med. 10(1): 30-3; 1970.* (3 references) (Russian)

Chemically pure herbicide 243 (a sulfur-containing *s*-triazine synthesized at the Armenian Agricultural Institute) was investigated for its toxicity in experiments on white rats and rabbits. The studies showed that herbicide 243 belongs to the group of moderately toxic compounds according to the classification adopted by the USSR for agricultural chemical poisons. On oral administration, its LD50 is equal to 560 plus/minus 33.2 mg/kg; its LD100 is 780 mg/kg and the maximum survivable dose is 340 mg/kg. The threshold dose for preparation 243 which does not elicit changes in the summation capacity of the central nervous system is equal to 34 mg/kg. (Author abstract translated and modified)

72-0158. Vashkov, V.I.; Dedov, V.S.; Dremova, V.P.; Smirnova, S.N.; Osipian, V.T.; Kazhdan, V.B.; Maslii, L.K.;

Kochanova, A.P.; Markina, V.B.; Belan, A.A.; Davydov, G.M. (All-Union Res. Inst. of Disinfection and Sterilization, Moscow, USSR). **Rezultaty izucheniya repellenta karboksida v razlichnykh klimaticheskikh zonakh strany. [The results of studying the repellent carboxide in different climatic zones of the country.]** *Zh. Mikrobiol. Epidemiol. i Immunobiol. 47(10): 66-72; 1970.* (5 references) (Russian)

Carboxide is an effective repellent in relation to mosquitoes, gnats, individual species of horseflies and *Ixodes persulcatus* ticks. When creams and lotions containing 30% of the preparation are applied to the skin, their protective action lasts 4 to 8 hr. Clothing impregnated with a 15% aqueous emulsion of carboxide protects against mosquitoes and gnats for 15 days and against ticks for 10 days. Carboxide is a preparation of low toxicity: its LD50 for various species of laboratory animals (given internally) ranged in the limits of 2200 to 2800 mg/kg, Carboxide has the inherent ability to be absorbed through the skin; in this connection, the forms intended for skin application should contain added protective film-forming substances (of the type of ethyl cellulose, silicones, etc.). Under conditions of practical use of the repellent (predominantly volunteers), it was established that all of the forms of carboxide studied (creams, lotions, emulsions, etc.) showed no untoward action on the human organism [data tabulated]. The use of nonpurified carboxide to prepare different forms of the repellent is not permissible since it might cause skin irritation. Carboxide can be recommended for industrial production. (Author abstract translated)

72-0159. Nagasawa, S.; Asano, S. (Biological Res. Lab., Kumiai Chemical Industry Co., Shimizu, Japan). **[Studies on the biological assay of chemicals to fish. VII. Toxicity of some agricultural chemicals to the carp.]** *Noyaku Seisan Gijutsu 21: 2-8; 1970.* (8 references) (Japanese)

The toxicity of Kitazin-P (O,O-diisopropyl S-benzyl thiophosphate) emulsifiable concentrate to carp was evaluated by means of individual and group response records. The group records were made by the standard method established officially by the Ministry of Agriculture and Forestry of Japan in November 1965. PCP-Na salt was used as the standard chemical. The relative toxicities of Kitazin-P emulsifiable concentrate and PCP–Na salt were 0.0174 and 0.0180 in the individual and group record experiments, respectively. Since the two figures were almost the same, reliable evaluation of the fish toxicity of the pesticides was possible by either method. In the individual record experiment, usually a very small number of test organisms were sufficient to achieve the proper toxicity of the test samples. The toxicity of Danifos (PTMD) emulsifiable concentrate was evaluated with 32 carp. A similar result was also possible with other kinds of fish and chemical mixtures. The results of an experiment using 40 goldfish and Daconil (tetrachloroisophthalonitrile) wettable powder or CT-42 (N-dodecylguanidine acetate plus thiram) wettable powder are given as examples. It is suggested that the toxicities of pesticides be given with figures relative to that of the standard chemical. The ranking of toxicity grades should also be made on their relative toxicities. An example of the indication and ranking of fish toxicity is shown. (Journal abstract edited)

72-0160. Herzel, F.; Leudemann, D. (Institut fuer Wasser-, Boden- und Lufthygiene, Bundesgesundheitsamt, Berlin-Dahlem, Corrensplatz 1, 1 Berlin 33, Germany). **Verhalten und Toxizitaet von Endosulfan im Wasser unter verschiedenen Versuchsbedingungen. [Behavior and toxicity of endosulfan in water under different experimental conditions.]** *Z. Angew. Zool. 58(1): 57-61; 1971.* (4 references) (German)

Thepresence of endosulfan in the Rhine in June 1969 was responsible for killing large numbers of fish. Previous workers have reported toxic levels of 1 to 11 mcg/1 towards fish including carp. The results of determining the toxicity of endosulfan in water to fish are now reported. Experiments were carried out using a mixture of the *alpha*- and *beta*-forms of endosulfan on guppies *(Lebistes reticulatus).* A decrease in concentration with time was recorded in the presence or absence of the fish and with or without aeration. The LD50 with aeration was about 4.2 mcg/1 after 72 hr. During the 72-hr period, the initial concentration of 4.2 mcg/1 fell to about 0.09 mcg/1, whereas in the absence of the fish it fell to 0.13 mcg/1. In the absence of aeration, the kill at an initial concentration of 4.2 mcg/1 was much higher (17 to 20 deaths) and the concentration of endosulfan after 72 hr was 0.6 mcg/1.

72-0161. Tinsley, I.J.; Haque, R.; Schmeddling, D. (Dept. of Agricultural Chemistry and Environmental Health, Oregon State U., Corvallis, OR 97331). **Binding of DDT to lecithin** *Science 174(4005): 145-7; 1971.* (7 references)

An interaction between DDT and lecithin is indicated by the reciprocal effects of each compound on the proton magnetic resonance spectrum of the other. The phosphoryl choline moiety of the lecithin and the benzylic proton of the DDT seem to be involved. The most pronounced response in the proton magnetic resonance spectrum of the lecithin produced by increasing concentrations of DDT was a change in the chemical shift of the resonance peak due to the protons of the choline methyl groups. Increasing concentrations of lecithin produced changes in the chemical shift of the resonance peaks of the benzylic proton and adjacent ring protons of the DDT. An equilibrium constant of 0.0597 plus/minus 0.015/molal was obtained for this interaction. (Author abstract by permission, copyright 1971 by the American Association for the Advancement of Science)

72-0162. Collins, D.J.; Gaunt, J.K. (Dept. of Biochemistry and Soil Science, U. College of North Wales, Bangor, Caernarvonshire, Wales). **The metabolism of 4-chloro-2-methylphenoxyacetic acid in plants.** *Biochem. J. 124(2): 9P; 1971.* (1 reference)

Abstract of a paper presented at the 515th meeting of The Biochemical Society at the University College of North Wales in Bangor, Wales, May 20-21, 1971.

72-0163. Hart, M.M.; Adamson, R.H.; Fabro, S. (Sect. of Pharmacology and Exptl. Therapeutics, Lab. of Chemical

Pharmacology, National Cancer Inst., National Inst. of Health, Bethesda, MD 20014). **Prematurity and intrauterine growth retardation induced by DDT in the rabbit.** *Arch. Intern. Pharmacodyn. 192(2): 286-90; 1971.* (28 references)

Following sacrifice on day 28 of pregnancy, the number of implantations, resorptions and fetuses were recorded for pregnant New Zealand white rabbits that had received oral *p,p'*-DDT (50 mg/kg) in corn oil on days 7, 8 and 9 of gestation. Eight of 14 does treated with *p,p'*-DDT (57%) delivered before day 28 of gestation. The average day of birth of treated does delivering prematurely was 25.6 days. The earliest litter was born on day 24 of pregnancy. Of 15 untreated animals, none delivered prior to day 30. In addition to causing prematurity, *p,p'*-DDT treatment increased the number of resorption sites. Approximately 25% of the implantations in the *p,p'*-DDT-treated rabbits ceased to develop and underwent lysis *in utero* compared to 2% of corn oil-treated controls. Moreover, the weight of the viable fetuses at 28 days was significantly lower in the *p,p'*-DDT-treated animals than in the controls. Although *p,p'*-DDT causes a retardation of intrauterine growth, it is not teratogenic at this dose level. (Author abstract by permission)

72-0164. Philpot, R.M.; Hodgson, E. (Dept. of Entomology, North Carolina State U., Raleigh, NC 27607). **A cytochrome P-450-piperonyl butoxide spectrum similar to that produced by ethyl isocyanide.** *Life Sci. II 10(9): 503-12; 1971.* (15 references)

Piperonyl butoxide produces a typical type I substrate difference spectrum with cytochrome P-450 in the oxidized state. However, the inclusion of NADPH with piperonyl butoxide effects a spectrum similar to that of ethyl isocyanide. This resemblance includes the location and shape of the two Soret peaks and the effect of pH on their relative magnitudes. (Author abstract)

72-0165. Reiff, B.; Lambert, S.M.; Natoff, I.L. (Tunstall Lab., Shell Res. Ltd., Sittingbourne, Kent, England). **Inhibition of brain cholinesterase by organophosphorus compounds in rats.** *Arch. Intern. Pharmacodyn. 192(1): 48-60; 1971.* (13 references)

The i.v. injection of organophosphorus compounds [monocrotophos, dicrotophos, dichlorvos, mevinphos, crotoxyphos, chlorfenvinphos, SD 14045 (WL 14045; dimethyl phosphate of 3-hydroxy-*p*-(methylthio)-*alpha*-methyl benzyl cis-crotonate), WL 22864 (2-chloro-1-(2,4-dichlorophenyl) vinyl ethyl ethylphosphonate) and paraoxon] in rats anesthetized with urethane produces a dose-related inhibition of brain cholinesterase at 150 sec. The median inhibitory dose (ID50) for each compound is shown to be directly related to the water-lipid partition characteristic, Rm, and inversely related to the enzyme inhibitory power expressed as the bimolecular rate constant ki^1. (Author abstract by permission, modified)

72-0166. Eller, L.L. (Fish Pesticide Res. Lab., Bur. of Sport Fisheries and Wildlife, U.S. Dept. of the Interior, Route No. 1, Columbia, MO 65201). **Histopathologic lesions in cutthroat trout** *(Salmo clarki)* **exposed chronically to the insecticide endrin.** *Am. J. Pathol. 64(2): 321-36; 1971.* (35 references)

Pathologic conditions associated with exposure to endrin were found in the gill, liver, pancreas, brain and gonad of cutthroat trout. Edema, hemorrhage and possibly intracapillary congestion characterized gill damage after exposure to the highest level of endrin in the bath. Hepatic lesions in young trout were of a type frequently described as preceding the development of hepatomas in nutritionally deficient fish. The increased incidence and severity of hepatic degenerative changes observed in fish exposed to high levels of endrin suggested nutritional deficiency enhanced by exposure to endrin. Marked hyperplasia of the pancreatic islets and irregular, atypical oocytes were observed after exposure to high endrin levels. (Author abstract)

72-0167. Barfknecht, C.F.; Benz, F.W.; Long, J.P. (Div. of Medicinal Chemistry, Col. of Pharmacy, U. of Iowa, Iowa City, IA 52240). **Potential acetylcholinesterase reactivators: *p,p'*-biphenyl and 1,4-benzene disubstituted oximes.** *J. Med. Chem. 14(10): 1003-4; 1971.* (5 references)

Three compounds were examined against pralidoxime (2-PAM) for their ability to reactivate electric eel acetylcholinesterase (AChE) inhibited with diethylphosphorylthiocholine: 1) *p,p'*-bis-(pyridinium-4-aldoxime acetyl)biphenyl dibromide, 2) *syn,syn*-1,4-bis(pyridinium-4-carbaldoxime acetyl)benzene and 3) TMB-4. With 2-PAM equal to 1, the relative potency of the compounds as AChE reactivators was as follows: 1) 0.62, 2) 0.55 and 3) 4.8. Compounds 1 and 2 were AChE inhibitors at concentrations where they function as reactivators. 2-PAM and TMB-4 were effective reactivators at concentrations where no inhibition occurs.

72-0168. Raheja, K.L.; Reber, E.F.; Bert, M.H.; Snedecor, J.G. (Dept. of Pharmacology, Upstate Medical Center, Syracuse, NY 13210). **Response of prothrombin rate to exogenous testosterone in rats fed Dicumarol.** *Indian J. Physiol. Pharmacol. 14(4): 253-8; 1970.* (19 references)

Forty-eight castrated adult rats of the Charles River strain were used in a 2 week experiment to test the possibility that the variable effect of the same dose of Dicumarol in different persons may be partly due to individual variation in the circulating plasma testosterone level. The combined effect of Dicumarol and testosterone at various dose levels was measured in terms of prothrombin and mortality rates due to hemorrhagic diathesis. Testosterone propionate was administered s.c. at the levels of 0, 0.5 and 1.5 mg/rat/week. Dicumarol was fed in the ration at the rate of 0 and 40 mg/kg of diet. The rats were bled at the start of the experiment and again at the end of the first and second weeks. Testosterone alone at either dose level did not influence the prothrombin time. Dicumarol caused a decrease (p less than 0.05). in the prothrombin rate at the end of weeks 1 and 2. In the presence of Dicumarol, testosterone caused a decrease (p less than 0.05) in the prothrombin rate at the end of week 2. The data indicate a synergistic effect of testosterone and Dicumarol on

prothrombin and mortality rates. These results support the hypothesis that the variable effect of the same dose of Dicumarol on the prothrombin time in different individuals could be in part due to individual variation in the circulatory plasma testosterone level. (Author abstract)

72-0169. Srebocan, V.; Gotal, J.P.; Adamovic, V.; Sokic, B.; Delak, M. (Inst. of Physiology and Pathology of Animal Production, Zagreb, Yugoslavia). **Effect of technical grade DDT and *p,p'*-DDT on adrenocortical function in chicks.** *Poultry Sci. 50(5): 1271-8; 1971.* (37 references)

The effect of the oral administration of subtoxic doses of technical grade DDT and toxic doses of technical grade DDT and *p,p'*-DDT on the adrenocortical function in chicks was investigated. In parallel tests, the concentrations of *o,p'*-DDT, *p,p'*-DDT, *p,p'*-DDE and *p,p'*-DDD were determined in tissues from the adrenals, brain and liver of chicks treated with subtoxic doses of technical grade DDT. Subtoxic amounts of technical grade DDT inhibited corticosterone synthesis in chicks. Toxic doses of technical grade DDT and *p,p'*-DDT had the same effect on the surviving animals. Reduced corticosterone concentration in the adrenals also affected the activity of gluconeogenesis so that the liver glycogen concentration was reduced at the same time. The degree of adrenal corticosterone reduction was, as a rule, proportional to the dose of the insecticide, or to the concentration of metabolities in the adrenal tissue. However, in terms of time, it took place earlier in animals treated with higher doses. The concentration of the determined components and metabolities of technical grade DDT was significantly higher in adrenal tissue than in brain or liver tissue. The deposition of these substances in adrenal and brain tissue was quantitatively limited. (Author abstract by permission, edited)

72-0170. Donaldson, W.E.; Jackson, M.D.; Sheets, T.J. (Dept. of Poultry Science & Pesticide Residue Res. Lab., North Carolina State U., Raleigh, NC 27607). **Influence of iodinated casein on DDT residues in chicks.** *Poultry Sci. 50(5): 1316-20; 1971.* (7 references)

Two experiments were conducted to compare the effects of diets containing 0, 0.03 or 0.06% iodinated casein (IC) on the elimination of DDT residues from full-fed and periodically starved chicks which had been dosed previously with DDT. Periodic starvation and dietary IC decreased the body fat content and tended to increase the conversion of DDT to DDE. The changes in DDE and DDT concentrations in the adipose tissue of starved and 0.03% IC-fed birds were offsetting and hence, total residue concentrations were not affected greatly by the treatments. When 0.03% IC was fed for longer periods or when 0.06% IC was fed, the elimination of DDE appeared to be stimulated in starved birds; concentrations of total residue were lower than in starved birds which did not receive IC. Similar patterns were observed for estimated body burden of residues. Because of the lower body fat content of starved and IC-treated birds, body burdens of the residues in these groups were lower than in comparable control groups even when concentration values were equal to or higher than control values. The effects of IC were more pronounced in starved than in full-fed birds. (Author abstract by permission)

72-0171. Yamamoto, R.S.; Weisburger, J.H.; Weisburger, E.K. (Exptl. Pathology Branch, National Cancer Inst., Bethesda, MD 20014). **Controlling factors in urethan carcinogenesis in mice: Effect of enzyme inducers and metabolic inhibitors.** *Cancer Res. 31(5): 483-6; 1971.* (16 references)

The influence of various compounds on pulmonary tumor formation in mice after a single dose of urethan was investigated. Pretreatment by the microsomal enzyme inducers chlordane, phenobarbital and *beta*-naphthoflavone reduced the yield of lung tumors, but phenothiazine and diethylaminoethyl diphenyl valerate (SKF-525A) did not. None of these agents by themselves were carcinogenic to the mouse lung in a 16-week test. 3-Methylcholanthrene pretreatment induced lung tumors, the incidence of which was decreased by the subsequent injection of urethan. Treatment with actinomycin D, puromycin and cycloheximide, which are expected to affect macromolecular synthesis, gave the same pulmonary tumor incidence after a single dose of urethan as that noted in controls given the vehicle plus urethan. These data demonstrate that certain enzyme inducers sharply modify the pulmonary tumor yield, but they fail to give a clue to the possible existence of an active metabolite derived from urethan, or the need for macromolecular synthesis in target cells for the operation of the induction process. (Author abstract)

72-0172. Wehr, N.B.; Klein, D.A. (Dept. of Microbiology, Oregon State U., Corvallis, OR 97331). **Herbicide effects on *Bdellovibrio bacteriovorus* parasitism of a soil pseudomonad.** *Soil Biol. Biochem. 3(2): 143-9; 1971.* (16 references)

Bdellovibrio bacteriovorus, a small endoparasitic bacterium indigenous to soil, mud and sewage, can attack and penetrate other susceptible Gram-negative bacteria, causing host lysis and release of parasite progeny into the surrounding environment. Seventeen commercial herbicides were tested for activity against a *Bdellovibrio* strain, isolated from soil, and its *Pseudomonas* sp. host using disc assay techniques. Eleven of the seventeen herbicides inhibited the *Bdellovibrio* plaque growth, while only one agent, DNBP (4,5-dinitro-*o*-sec-butylphenol), showed evidence of *Pseudomonas* host inhibition. Of these eleven herbicides, linuron (3-(3,4-dichlorophenyl)-1-methoxy-1-methylurea) was studied further because it inhibited *Bdellovibrio* plaque growth almost completely. A decrease in net multiplication of *Bdellovibrio* with increasing linuron concentration occurred in young broth cultures of the parasite with no alterations in parasite motility, attachment rate or penetration rate. In the absence of normal host concentrations, precluding penetration and attachment, *Bdellovibrio* was also sensitive to the herbicide, indicating that linuron primarily increased the death rate rather than influencing only the secondary characteristics of motility, attachment and penetration. The lethal effect of linuron on *Bdellovibrio* does not involve magnesium chelation. (Author abstract)

72-0173. Choudhury, S.R.; Lundy, A.M. (The Histochemical Lab., Dept. of Anatomy, U. of Manchester, Manchester M13 9PL, England). **Differential inhibition of esterase isozymes by organophosphorus compounds.** *J. Histochem. Cytochem. 19(6): 390-2; 1971.* (4 references)

The problem of classifying nonspecific carboxylic esterases is discussed with relation to the differential sensitivity that individual isozymes exhibit toward organophosphorus compounds in different substrates. Zymograms of skeletal muscle, placental and stomach esterases from the rat are reproduced to illustrate the discussion. The zymogram of the skeletal muscle esterases showed at least four distinct isozymes that strongly hydrolyze *alpha*-naphthyl acetate (NA), *alpha*-naphthyl propionate (NP) and *alpha*-naphthyl butyrate (NB). Pretreatment with diethyl *p*-nitrophenyl phosphate (E600 or paraoxon) resulted in an overall decrease of cathodal activity with NA, but the individual zymogram bands still stood out. With NP and NB, an almost total inhibition of the fastest moving cathodal band was observed and other bands appeared highly sensitive to E600 with NB. Similar phenomena were observed in the other zymograms. The cause of such differential inhibition is discussed. It is suggested that the so-called isozymes separated by electrophoresis are not pure entities, but aggregates of closely related esterase species having different organophosphate sensitivity. On the other hand, if the isozymes are pure, the substrates themselves may be involved in the inhibitory mechanism. Work on the underlying mechanism of the differential inhibition of esterase isozymes by organophosphorus compounds is in progress.

72-0174. Knowles, C.O.; Ahmad, S. (Dept. of Entomology, U. of Missouri, Columbia, MO 65201). **Comparative metabolism of chlorobenzilate chloropropylate and bromopropylate acaricides by rat hepatic enzymes.** *Can. J. Physiol. Pharmacol. 49(6): 590-7; 1971.* (6 references)

The metabolism of ethyl 4,4'-dichlorobenzilate (chlorobenzilate; CB), isopropyl 4,4'-dichlorobenzilate (chloropropylate) and isopropyl 4,4'-dibromobenzilate (bromopropylate) by rat hepatic enzymes was studied *in vitro*. The carbon-14-labeled acaricides were incubated with the following fractions of homogenated male Sprague-Dawley rat liver: nuclear and cellular debris, nuclear supernatant, mitochondrial, microsomal and soluble. CB was actively metabolized by all the fractions. Maximum metabolic activity occurred in the nuclear supernatant and microsomal fractions, where 74.1 and 75.4%, respectively, of the CB was metabolized. CB degraded to DBA (4,4'-dichlorobenzilic acid), DBH (4,4'-dichlorobenzhydrol), DBP (4,4'-dichlorobenzophenone), CBA (*p*-chlorobenzoic acid) and at least three unidentified compounds; DBA degraded to DBH, DBP, CBA and at least three unidentified compounds. DBH degraded to DBP, CBA and at least four unidentified compounds; and CBA degraded to at least three unidentified compounds. While chloropropylate was considerably more resistant to degradation than CB, its degradation products were qualitatively similar. The nuclear and mitochondrial fractions were most active; these were followed by the soluble, nuclear supernatant and microsomal fractions. The chief organosoluble metabolite was DBP. Bromopropylate was the most resistant of the acaricides to enzymatic degradation. More than 93% remained unchanged after incubation with the precipitated liver fractions for 4 hr. The limiting factor in the degradation of the three compounds was cleavage of the carboxylic ester linkage by hepatic carboxylesterases. NADPH was not required in the incubation mixtures for cleavage, but it did facilitate further degradation of some matabolities. SKF-525A (2-dimethylaminoethyl 2,2-diphenylvalerate) enhanced the degradation of CB by the mitochondrial and microsomal fractions, but partially blocked the degradation of DBA. DFP (diisopropyl phosphorofluoridate) completely blocked the degradation of all three acaricides.

72-0175. Johsnon, B.T.; Saunders, C.R.; Sanders, H.O.; Campbell, R.S. (Fish-Pesticide Lab., Bur. of Sport Fisheries and Wildlife, Columbia, MO 65201). **Biological magnification and degradation of DDT and aldrin by freshwater invertebrates.** *J. Fisheries Res. Board Can. 28(5): 705-9; 1971.* (11 references)

The biological magnification and degradation of *p,p'*-DDT and aldrin were investigated in laboratory experiments with ten species of freshwater crustaceans and insects. The organisms were exposed to constant concentrations (less than 100 ng/l) of the carbon-14-labeled insecticides in a continuous-flow apparatus for up to 3 days. Total body residues were determined at 24-, 48- and 72-hr intervals (tabulated). Degradation products in the organisms were identified after the 3-day exposure (tabulated for DDT). The direct uptake of the compounds by all species was rapid. The biological mangification factors ranged from 880 to 58,000 on the first day, from 910 to 133,600 on the second day and from 2900 to 141,000 on the third day. The insects converted DDT primarily to DDE. In some crustaceans, the degradation process appeared more complex because DDD, DTMC (1,1,1-trichloro-2,2-bis(*p*-chlorophenyl)-ethanol) and DBP (4,4'-dichlorobenzophenone) were detected in addition to DDE. The aldrin-to-dieldrin conversion rate was less than 25% in all cases. No other aldrin degradation products were detected.

72-0176. Bovard, K.P.; Fontenot, J.P.; Priode, B.M. (Dept. of Animal Science, Virginia Polytechnic Inst. and State U., Front Royal, VA 22603). **Accumulation and dissipation of heptachlor residues in fattening steers.** *J. Animal Sci. 33(1): 127-32; 1971.* (12 references)

Four lots of five yearling steers (Angus and Shorthorn) were fed various diets in a study of the accumulation of heptachlor residues in fatty tissues. All the steers (288-kg average weight) were fed fattening diets containing 0.19 ppm of heptachlor and heptachlor epoxide (HHE) for 189 days (phase 1). In the following 523 days (phase 2), lot 1 steers received the same diet, lot 2 received a residue-free diet, lot 3 received a residue-free diet containing 883 mg thyroprotein (protamone)/kg feed and lot 4 received a reduced residue-free diet. HHE residues were determined by gas-liquid chromatography in perianal fat excised at the beginning of the experiment, five times during the experiment and at the end of the experiment when the steers were slaughtered. During phase 1, the daily weight gains were 0.99 kg. During phase 2, the daily weight

gains for lots 1,2,3 and 4 were 0.48, 0.57, 0.38 and -0.03 kg, respectively. HHE residues increased at 0.02 ppm/week during phase 1. The maximum HHE residues were as follows (in ppm): lot 1, 0.96 at 58 weeks; lot 2, 0.70 at 38 weeks; lot 3, 0.84 at 40 weeks; and lot 4, 1.11 at 46 weeks. Neither restricting the diet (lot 4) nor the addition of thyroprotein (lot 3) increased the dissipation rate of HHE residues above that of lot 2 cattle on a plain residue-free diet. No gross symptoms of poisoning were observed in any cattle.

72-0177. Davis, B.N.K. (The Nature Conservancy, Monks Wood Exptl. Station, Abbots Ripton, Huntingdon, England). **Laboratory studies on the uptake of dieldrin and DDT by earthworms.** *Soil Biol. Biochem. 3(3): 221-33; 1971.* (23 references)

The uptake of dieldrin and DDT by *Lumbricus terrestris* and *Allolobophora caliginosa* was studied. Both compounds appeared to be absorbed at similar rates but owing to the metabolism of both the *p,p'*- and *o,p'*-isomers of DDT to *p,p'*-DDE, less of the DDT group was accumulated. The levels of DDT and metabolities in *L. terrestris* were linearly related to DDT concentrations in the soil between 1 and 64 ppm; DDE was about 20% and TDE about 6% of the respective DDT levels in the worms. *A. caliginosa* accumulated markedly higher residues than *L. terrestris* when the pesticide was incorporated into the soil but the opposite occurred when the pesticide was presented on sprayed leaves at the soil surface. Uptake from the soil was affected by soil type. An inverse relationship with organic matter content was demonstrated. (Author abstract)

72-0178. Fimreite, N.; Karstad, L. (Dept. of Zoology, U. of Western Ontario, London, Ontario, Canada). **Effects of dietary methyl mercury on red-tailed hawks.** *J. Wildlife Management 35(2): 293-300; 1971.* (11 references)

Six groups of 1-year-old red-tailed hawks *(Buteo jamaicensis)* of three birds each were fed chicks contaminated with methyl mercury [Parogen 15, a commercial seed treatment containing 2.5% methyl mercury dicyandiamide] at three different levels (3.9, 7.2, and 10.0 ppm of mercury were found in their livers, respectively). The experimental feeding periods were 4 or 12 weeks. Mortality occurred in the groups on the most contaminated diets after an exposure period of 1 month or more, the signs of poisoning prior to death being essentially neurological. The mercury levels in the livers of hawks that succumbed to mercury poisoning were about 20 ppm. These hawks, and those that survived on the two most heavily contaminated diets, showed pathological changes. The most consistent changes were swelling of the axons of the myelinated nerves in the spinal cord, with dilatation of the myelin sheaths and loss of myelin. (Author abstract, modified)

72-0179. Shtenberg, A.I.; Ozhovan, M.V. (Lab of the Toxicology of Pesticides, Inst. of Nutrition, Acad. of Medical Sciences, Moscow, USSR). **Vliyanie malykh soz sevina na generativnuyu funktsiyu zhivotnykh v ryade pokoleniy. [The effect of small doses of Sevin on the reproductive function of animals in a series of generations.]** *Vopr. Pitaniya 30(1): 42-9; 1971.* (17 references) (Russian)

The effect of Sevin (carbaryl) in doses of 2 and 5 mg/kg body weight on the reproductive function was investigated in rats. Both doses of Sevin caused an unfavorable effect on the function of the testicles and ovaries and disordered the gonadotropic function of the hypophysis. The observed changes progressed from generation to generation. There was a decrease in fertility among the experimental animals, a high loss of progeny during the first month of life and a lag in physical development in comparison with analogous indices in control animals. The functional changes, seen in the testicles and ovaries, were confirmed by histological and histochemical studies which revealed atrophic, dystrophic and necrotic changes which progressed from generation to generation. The earlier established threshold dose of Sevin (2 mg/kg) under the conditions of the present experiment was found to be operative. It is necessary to review the maximum permissible residue established for this preparation in food products in order to lower it. (Author abstract translated)

72-0180. Wheeler, L.; Strother, A. (Dept. of Pharmacology, Loma Linda U. School of Medicine, Loma Linda, CA 92354). ***In vitro* metabolism of the N-methylcarbamates, Zectran and Mesurol, by liver, kidney and blood of dogs and rats.** *J. Pharmacol. Exptl. Therap. 178(2): 371-82; 1971.* (15 references)

The metabolism of Zectran (4-dimethylamino-3,5-xylyl methylcarbamate) and Mesurol (4-methylthio-3,5-xylyl methylcarbamate) was studied in incubation mixtures containing the carbon-14-labeled carbamates and liver or kidney homogenates or blood from male Sprague-Dawley rats and mongrel dogs. Based on the amount of unmetabolized Zectran on thin-layer chromatographic plates, liver enzyme activity was greater in the dog. The major route of Zectran metabolism in the liver homogenates of both species was N-dealkylation of the tertiary *para*-nitrogen to a secondary amine, 4-methylamino-3,5-xylyl N-methylcarbamate. Complete N-dealkylation to the primary amine, 4-amino-3,5-xylyl N-methylcarbamate, was another significant metabolic route. 4-Dimethylamino-3,5-xylyl N-hydroxylmethyl carbamate and 4-methylformamido-3,5-xylyl N-methylcarbamate were also identified as major metabolites. The rat liver homogenates were the more active in metabolizing Mesurol. Sulfoxidation of Mesurol produced the major ether-extractable metabolite, 4-methylsulfinyl-3,5-xylyl methylcarbamate. 4-Methylthio-3,5-xylyl N-hydroxymethylcarbamate was also tentatively identified. Based on the amount of radioactivity that remained in the aqueous phase after ether extraction of the liver incubation mixtures, the formation of water-soluble metabolites appeared to be the major route of Measurol metabolism. The whole blood of the rat and dog had N-dealkylating properties, but no sulfoxidation properties. Overall metabolic activity in the blood was low. The major ether-extractable metabolite was 4-methylamino-3,5-xylyl N-methlycarbamate. The metabolic activity in the kidney homogenates was still lower than that in the blood. Under the conditions of these experiments, 91 to

98% of the carbamates were metabolically altered by the enzyme systems of the rat and dog.

72-0181. Vukovich, R.A.; Triolo, A.J.; Coon, J.M. (Dept. of Pharmacology, Jefferson Medical Col., 1020 Locust St., Philadelphia, PA 19107). **The effect of chlorpropmazine on the toxicity and biotransformation of parathion in mice.** *J. Pharmacol. Exptl. Therap. 178(2): 395-401; 1971.* (30 references)

The effect of chlorpromazine (CPZ) on the toxicity and biotransformation of parathion was studied in experiments with male Swiss-Webster mice. The mice were injected i.p. with 30 mg CPZ/kg body weight at various times from 1 hr to 3 days before they received oral doses or parenteral injections of various amounts of parathion or paraoxon. CPZ treatments 1 and 6 hr before the oral administration of parathion and paraoxon increased the toxicities of these agents, whereas CPZ treatments 1 day before decreased their toxicities. CPZ offered no significant protection against either agent after a 3-day interval, CPZ offered protection against both compounds when they were orally administered than when they were injected i.v. The supernatant and microsomal liver fractions from mice treated with CPZ 1 hr or 1 day previously were incubated *in vitro* with parathion. The ability of both fractions to convert parathion to paraoxon was reduced after the 1-hr interval, but increased after the 1-day interval. Paraoxon detoxication was not significantly affected after either time interval. CPZ pretreatment had no effect on the inhibition of cholinesterase in plasma, red blood cells and whole blood by parathion and paraoxon (administered i.v.) after a 1-day interval. Brain cholinesterase activity was significantly higher and parathion levels in the brain were significantly reduced. There was no significant difference between parathion levels in the plasma of control and CPZ-treated mice at 15, 30, 60 or 90 min after the administration of parathion. The findings suggested that CPZ exerts a protective effect against parathion and paraoxon by decreasing the permeability of the blood-brain barrier.

72-0182. Khaikina, B.I.; Shilina, V.F. (Author address not given). **The effect of some organochlorine pesticides on the serotonin metabolism.** *Russ. Pharmacol. Toxicol. 34(3): 156; 1971.*

English translation; for an abstract of the original Russian article see 71-1938.

72-0183. Kagan, Yu. G.; Sasinovich, L.M.; Danilenko, L.P. (Author address not given). **Comparative evaluation of the therapeutic effect of dipyroxime in test animal poisoning with some organophosphorus compounds.** *Russ. Pharmacol. Toxicol. 34(3): 156; 1971.*

English translation; for an abstract of the original Russian article see 71-1939.

72-0184. Belayeva [sic], V.H.; Politykhin, A. Ya. (Biophysics Inst., SSSR [sic] Min. of Health, Moscow, USSR). **Experimental therapy of acute propylene oxide poisoning.** *Russ. Pharmacol. Toxicol. 34(3): 144-8; 1971.* (8 references)

English translation; for an abstract of the original Russian article see 71-1940.

72-0185. Stephan, U.; Schuette, H.R. (Institut fuer Biochemie der Pflanzen, Deutsche Akademie der Wissenschaften zu Berlin, Weinbergweg, 401 Halle (Saale), German Democratic Republic). **Zum Metabolismus von Chlorcholinchlorid in hoeheren Pflanzen. [The metabolism of chlorocholine chloride in higher plants.]** *Biochem. Physiol. Pflanzen 161(6): 499-510; 1970.* (36 references) (German)

The growth retardant, chlorocholine chloride (2-chloroethyl)trimethylammonium chloride; CCC), is partially metabolized in several higher plants (barley, wheat, tobacco and maize) to choline. The choline contains 10 to 20% of the radioactivity isolated from these plants after the application of CCC-14-CH3. A small portion of the radioactivity could also be located in the betaine fraction. The methyl groups of the CCC are incorporated into the nicotine (from *Nicotiana rustica* L.) and gramine (from *Hordeum vulgare* L.) alkaloids with the same effectiveness as the methyl groups of the choline. (Author abstract edited and modified)

72-0186. Ragland, W.L.; Friend, M.; Trainer, D.O.; Sladek, N.E. (Poultry Disease Res. Center, U. of Georgia, Athens, GA 30601). **Interaction between duck hepatitis virus and DDT in ducks.** *Res. Commun. Chem. Pathol. Pharmacol. 2(2): 236-44; 1971.* (20 references)

N-demethylation of ethylmorphine (EM) by liver homogenates from adult mallard drakes was used to investigate the effects of duck hepatitis virus (DHV), DDT and DHV plus DDT on hepatic microsomal mixed-function oxidase activity. Ducks were injected i.v. with DHV 48 hr before being placed on diets containing 900 ppm or no DDT. After 8 days, the ducks were killed and the livers were prepared for the N-demethylation test. DDT treatment alone resulted in a significant increase in the N-demethylation of EM, while the DHV injections alone resulted in a decrease. DHV and DDT together resulted in greater N-demethylation activity than obtained with DDT alone. Gross and microscopic examinations of the duck livers revealed no acute necrosis.

72-0187. Saxena, P.K.; Aggarwal, S. (Dept. of Zoology-Entomology, Punjab Agricultural U., Ludhiana, India). **Toxicity of some insecticides to the Indian cat-fish, *Heteropneustes fossilis* (Bloch).** *Anat. Anz. 127: 502-3; 1970.* (9 references)

The toxicities of endrin (20% aqueous solution) and carbaryl (50%) to the Indian catfish *(Heteropneustes fossilis* Bloch) are reported. The survival times of the fish in various concentrations of endrin were as follows: 0.12 ppm, within 5 hr; 0.0140 ppm, 12 to 16 hr; and 0.00598 ppm, within 24 hr. Fish survived endrin concentrations of 0.00562 and 0.00578 ppm. At 50 ppm, carbaryl was fatal to the fish within 4 hr. At 40 ppm of carbaryl, 50% of the fish survived. Fish size and

minor fluctuations in temperature did not influence mortalities. Death was preceded by irritability, wild swimming, loss of equilibrium, excretion of mucus and blackening of the skin. It is concluded that endrin is 70 times more toxic than carbaryl to this species of fish.

72-0188. Ko, W.-H.; Lockwood, J.L. (Hawaii Agricultural Experiment Station, 461 W. Lanikaula St., Hilo, HI 96720). **Transfer of 32-P and dieldrin among selected microorganisms in soil.** *Rev. Ecol. Biol. Sol 7(4): 465-70; 1970.* (10 references)

The transfer of radioactive phosphorus and dieldrin among soil microorganisms was studied in incubation mixtures. Dieldrin was transferred from lysing mycelium of *Helminthosporium sativum* to *Streptomyces griseus*. The total amount transferred was 0.6% of that in the donor fungus. Of the dieldrin contained in carrot root tissue and bean seeds, 16 and 5%, respectively, were transferred to *Sclerotinia sclerotiorium* growing on the decaying tissue. The results with radioactive phosphorus are given.

72-0189. Dahlgren, R.B.; Linder, R.L. (South Dakota Cooperative Wildlife Res. Unit, Brookings, SD 57006). **Effects of polychlorinated biphenyls on pheasant reproduction, behavior and survival.** *J. Wildlife Management 35(2): 315-9; 1971.* (18 references)

The effect of Aroclor 1254 on the reproduction, behavior and survival of the pheasant *(Phasianus colchicus)* was studied. Two groups of five cocks were administered either 0 or 25 mg of the polychlorinated biphenyl (PCB) in capsules every week from February 13 to June 5, 1970. Each group was mated with three groups of five hens that were given weekly doses of 1, 12.5 or 50 mg PCB from February 20 to June 12. Eggs were gathered from March 7 to June 19 and hatched in an incubator. Two hens in the 50-mg treatment group died. Weight was not affected by the PCB treatments. The eggs laid/hen/day in the 50-mg treatment group was significantly lower than the egg-laying rates of the other groups. The number of eggs that were pipped but not hatched was significantly higher in the PCB-treated groups. Within 36 hr of hatching, the chicks were placed on a visual cliff and given 5 min to jump to the visually deep or shallow side. Of the offspring of the 50-mg PCB group, seven jumped to the deep side, 11 jumped to the shallow side and 11 made no choice. In contrast, of all the other groups combined, 15 jumped to the deep side, 132 jumped to the shallow side and 39 made no choice. Chicks hatched from hens in the 50-mg treatment group were significantly lighter at 6 weeks than other chicks and more deaths occurred among the chicks in this group.

72-0190. Young, R.G.; St. John, L.; Lisk, D.J. (Dept. of Entomology, New York State Col. of Agriculture, Cornell U., Ithaca, NY 14850). **Degradation of DDT by goldfish.** *Bull. Environ. Contam. Toxicol. 6(4): 351-4; 1971.* (14 references)

Goldfish *(Carassius auratus)* were fed diets containing up to 180 ppm of DDT for 3 weeks. They were then exposed to 75 ppm of sodium phenobarbital in the water for 1 week to determine if insecticide excretion would be enhanced. The fish were analyzed for DDT residues at intervals up to 6 weeks. Of the DDT fed, 40% was stored in the fish at the end of the DDT treatment. Of the stored DDT residues, 68 to 96% was recovered as DDE. Significant differences between the pesticide levels in phenobarbital-treated and control fish were not observed.

72-0191. Dindal, D.L.; Wurzinger, K.-H. (Dept. of Forest Zoology, State U. Col. of Forestry, Syracuse, NY 13210). **Accumulation and excretion of DDT by the terrestrial snail, *Cepaea hortensis*.** *Bull. Environ. Contam. Toxicol. 6(4): 362-71; 1971.* (11 references)

Laboratory experiments were undertaken to determine the amounts of DDT accumulated and excreted by the snail *Cepaea hortensis* Mueller after a single feeding of 60 mcg of chlorine-36-labeled *p,p'*-DDT, to determine the amount of DDT concentrated in 23 snail tissues and to study the dynamics of DDT in tissues at 3, 24, 48, 96 and 192 hr after the feeding. The mean whole-body (without shell) residues were as follows (in ppm): after 3 hr, 24.37; after 24 hr, 11.86; after 48 hr. 11.46; after 96 hr. 10.56; and after 192 hr, 11.05. Thus, the whole-body residues appeared to reach an equilibrium at about 11 ppm. Residue concentrations in similar kinds of tissues followed a similar trend in relation to time. Various tissues of the digestive system, for example, had high levels at 3 hr, but after 24 hr the levels were reduced and stabilized at a particular level for each tissue. The hepatopancreas residues, however, increased slightly through time. The heart and reproductive organ tissues showed a similar decrease in residues after 48 hr. Large quantities of residues were excreted in the feces. Some snails excreted more than half of the DDT fed to them. Small quantities were excreted in the mucus. Residues absorbed into the body accumulated chiefly in the hepatopancreas and ovotestis.

72-0192. Anonymous. **Decontaminating diary cows.** *Agr. Res. 19(12): 10; 1971.*

The results of experiments on the decontamination of pesticide-treated rats and cows with charcoal and barbituates are reported. The research was done by the Agricultural Research Service in Beltsville, Maryland. When charcoal was fed to rats in DDT-contaminated food, the retention of DDT was decreased 61%. It had no effect when it was fed for 14 days after the conclusion of the DDT treatment. Charcoal had no effect on DDT, DDE or dieldrin when it was fed to cows for 26 days beginning on the 14th day after the conclusion of the pesticide treatments. Sodium pentobarbital shortened the retention of DDD when it was fed for 20 days beginning 14 days after DDD contamination; it had no effect on DDT or dieldrin. Diphenylhydantoin was not effective in reducing DDT levels in cows. No ill effects from the treatments were observed.

72-0193. Kvitnitskaya, V.A.; Kolesnichenko, T.S. (Div. for the Study of Carcinogenic Effects, Inst. of Experimental and

Clinical Oncology, Acad. of Medical Sciences of the USSR, Moscow, USSR). **O transplatsentarnon blastomogennom deistvii tsineba na potomstvo myshei. [The transplacental blastomogenic action of zineb on mouse progeny.]** *Vopr. Pitaniya 30(1): 49-50; 1971.* (23 references) (Russian)

The possible blastomogenic action of zineb was studied in first-generation mouse progeny. Line A mice received zineb in the second half of pregnancy. The zineb was administered in an *ex tempore* suspension and injected in multiple doses i.p., calculated at 8 mg in 0.2 ml of cattle serum. At autopsy of the experimental females, small clumps of a nonresoluble substance were found in the abdominal cavity. At the doses used, zineb showed a pronounced embryotoxic action. There were no progeny when zineb was given in multiple doses. In all but two females given only two doses, pregnancy ended in miscarriage or stillbirths. Litters were obtained from 11 or 18 females on one dose of 4 mg zineb. Five females had miscarriages and two gave birth to extremely weak young that were consumed by the mothers within the first days. The 38 surviving young were weak, developed coats later and were retarded in weight; 18 died during the experiment and 20 were sacrificed at 4 months of age. Their lungs were examined microscopically. Three mice macroscopically showed nodules on the surfaces of the lungs. Microscopically, there were two cases of adenomas; in one case, there was a focal proliferation. Besides the macroadenomas, four mice had microadenomas of varying structures. No spontaneous adenomas were found. In these experiments, zineb produced pronounced embryotoxic effect, depending on the dose. It had significant blastomogenic action on the embryonic organism. Although insoluble in water and poorly resorbed in the tissues, zineb passed the placental barrier to cause pulmonary adenomas in 30% of the cases as well as preadenomatous changes reflecting the first stage of adenoma development.

72-0194. Clark, G. (Medical U. of South Carolina, Charleston, SC 29401). **Organophosphate insecticides and behavior, a review.** *Aerospace Med. 42(7): 735-40; 1971.* (35 references)

The author reviews the research literature concerning the behavioral effects of organophosphate insecticides on humans and laboratory animals. He finds that the human studies present 'a great maze of unexplained inconsistencies' and that studies of laboratory animals only add to the confusion. Among the criticisms leveled at the laboratory work are faulty experimental design, statistical naivete and unwarranted assumptions and conclusions. The 'bland assumption' that possible behavioral alterations can be explained solely by the reduction in acetylcholinesterase (AChE) with the concomitant increase in acetycholine is seen as a possible source of error in much experimental work. The failure of researchers to consider wide variations in AChE levels, the traumatic effects of drug administration by injection and intubation and the development of poison tolerance in laboratory animals are cited as other possible sources of experimental error. In view of the increasing use of the organophosphate pesticides, exact knowledge of the behavioral effects of these compounds is necessary. At the present time, any conclusion is 'decidedly premature.'

72-0195. Fromm, P. O.; Richards, B. D.; Hunter, R. C. (Dept. of Physiology, Michigan State U., East Lansing, MI 48823). **Effects of some insecticides and MS-222 on isolated-perfused gills of trout.** *Progressive Fish-Culturist 33(3): 138-40; 1971.* (4 references)

The effect of dieldrin (1 ppm), methoxychlor (1 ppm), rotenone (1 ppm), malathion (5 ppm) and MS-222 (an anesthetic) on the rate of fluid flow through isolated, perfused gills of rainbow trout (*Salmo gairdneri*) was studied. All the compounds except methoxychlor significantly reduced the flow of perfusion fluid (at constant pressure) through the gills: histological examination of the gills perfused with India ink showed that the decreased flow rates correlated well with increased lamellar perfusion.

72-0196. Sidell, F. R.,; Groff, W. A. (Clinical Medical Sciences Dept., Medical Res. Lab., Edgewood Arsenal, MD 21010). **Intramuscular and intravenous administration of small doses of 2-pyridinium aldoxime methochloride to man.** *J. Pharm. Sci. 60(8): 1224-8; 1971.* (17 references)

U. S. Army volunteers were administered i.m. or i.v. 2.5, 5.0, 7.5 or 10.0 mg of 2-pyridinium aldoxime methochloride (PAM)/kg body weight. Plasma levels and urinary excretion of PAM were monitored and side effects of the treatment were noted. Plasma concentrations greater than 4 mcg/ml (the level necessary for a therapeutic effect against certain pesticide poisonings) were attained only with two higher doses when the drug was injected into the deltoid muscle. These levels were reached in 5 to 10 min and were maintained for less than 1 hr. The urinary elimination of PAM was rapid. The half-times for elimination were 74 and 77 min, after i.v. and i.m. administration, respectively. Within 12 hr, 80.4% of the i.v. dose and 91% of the i.m. dose were eliminated unchanged in the urine. Intravenous injection was followed by a slight, transient increase in the heart rate. Subjects receiving the lowest dose had slight dizziness; those receiving 5.0 mg/kg had dizziness and three complained of blurred vision. At 7.5 mg/kg, the subjects noted dizziness and blurred vision and one complained of diplopia. At the highest dose, two subjects suffered double and blurred vision and a third complained of dizziness. These symptoms subsided in 3 to 4 min. There were no signs or symptoms following i.m. injection except mild pain at the injection site, which persisted for several hours. Equations describing the kinetics of blood concentration and urinary elimination of PAM are given.

72-0197. Bond, J.; Rumsey, T. S.; Richardson, G. V. (Animals Science Res. Div., ARS Beltsville, MD 20705). **Urea and aldrin in all-concentrate and high roughage diets fed to diethylstilbestrol-implanted heifers.** *J. Animal Sci. 33(2): 520-8; 1971.* (29 references)

Thirty-two grade Angus heifer calves were randomly assigned to 16 treatment combinations in a 2 to the 4th power factorial arrangement to compare: urea versus soybean meal from 14 days of age to slaughter (518 days); aldrin (a chlorinated hydrocarbon insecticide) added daily at 1 mg/kg

body weight versus no aldrin from 42 days to slaughter; all-concentrate diet based upon corn versus an 88% roughage diet from 84 days to slaughter; and 12 mg diethylstilbestrol (DES) implanted at 182 and again at 360 days versus no implant. From 98 to 182 days, heifers fed the all-concentrate diet gained 19% faster (p less than .01), consumed 81% less feed (p less than .01) but more net energy (p less than .01) than the roughage diet-fed heifers. The heifers fed soybean meal gained (0.66 versus 0.59 kg) faster (p less than .05) than those fed urea. The heifers fed the hay deit consumed 70% more feed and produced more (p less than .01) kg gain/megacalorie of net energy (.10 versus .08) than the heifers fed the all-concentrate diet from 182 to 518 days. Heifers implanted with DES gained 14% faster (p less than .01) and 8% more efficiently (p less than .05) and reached puberty 92 days sooner (p less than .01) than heifers without DES. Feeding aldrin at this level did not affect performance from 14 to 518 days. Slaughter and carcass grades, dressing percent, and marbling of the rib-eye were higher in the all-concentrate fed heifers. Meat from all-concentrate-fed heifers was more tender and more desirable than meat from roughage-fed heifers. According to the taste panel and Warner-Bratzler shear, the meat from DES-implanted heifers was more tender than meat from heifers with DES. Ruminal pH was lower in the heifers fed all-concentrate diets compared with those from heifers fed the hay diet. Hay-fed heifers had a greater total volume of rumen and omasum than those from heifers fed all-concentrate diets. The amount of ruminoreticular tissue was greater but the amount of omasal tissue was less in the all-concentrate diet-fed heifers. The adrenals and thyroids were heavier in the heifers fed aldrin than those in heifers not fed aldrin. (Author abstract)

72-0198. Persson, B. (Dept. of Animal Ecology, Ecology Building, Helgonavagen 5, S-223 62 Lund, Sweden). **Chlorinated hydrocarbons and reproduction of a south Swedish population of whitethroat.** *Sylvia communis. Oikos 22(2): 248-55; 1971.* (29 references)

The effects of sublethal doses of chlorinated hydrocarbons (lindane, aldrin, dieldrin, DDT, DDE, DDD and PCBs) on the breeding success in a whitethroat (*Sylvia communis*) population in south Sweden was studied. Thirty-two eggs and 69 young of different ages were collected and analyzed. The following was established: 1) All the samples contained DDT and its metabolities, DDE and DDD, and PCBs. 2) *Sigma*-DDT decreased in the young during the nestling period. 3) The contents of *sigma*-DDT in eggs of the same clutch varied less between eggs of different clutches. 4) Eggs and young containing much *sigma*-DDT also had the highest quantities of PCBs. 5) *Sigma*-DDT was to a higher extent metabolized in older young than in tender young and eggs. 6) Despite the load of chlorinated hydrocarbons, the breeding success of the whitethroat population was extraordinarily good. (Author abstract, edited)

72-0199. Hall, J. E.; Greichus, Y. A.; Severson, K. E. (Experiment Station Biochemistry Dept., South Dakota State U., Brookings, SD 57006). **Effects of aldrin on young pen-reared pheasants.** *J. Wildlife Management 35(3): 429-34; 1971.* (16 references)

Groups of 22 pen-reared, 5-week-old pheasants (*Phasianus colchicus*) were dosed with 0.5, 1.0 to 1.5 mg of encapsulated aldrin/week; an additional group of 22 birds was dosed with 0.5 mg of aldrin on alternate days to make a total dose of 1.5 mg/week. The birds were weighed weekly during the treatment, which ran for 7 weeks, and every other week thereafter until they were 21 weeks old. Two males from each group were killed 2, 6, 11 and 16 weeks after treatment began. Brains, whole bodies (with feathers but without brains) and feathers alone were analyzed for residues of aldrin and dieldrin. The 1.0- and 1.5-mg treatments depressed growth of the birds between 5 and 21 weeks of age. Except for the group that received the single 1.5-mg/wk dose, none of the birds showed signs of toxicosis. Aldrin levels in the brains and bodies of these birds differed little from control levels but dieldrin levels increased proportionately with dosage during the administration of aldrin. At the end of the experiment, after the birds had been off treatment for 10 weeks, the brain and body dieldrin levels were comparable with control levels. Eleven of the birds receiving 1.5 mg/wk in a single dose died within 48 hr of the first treatment. The mean aldrin plus dieldrin levels in these birds were as follows (in ppm): brain, 2.72; body, 2.38; and feathers, 0.81. Ten weeks after the treatments stopped, the surviving birds in this group had the following mean aldrin plus dieldrin levels (in ppm): brain, 0.15; body, 0.16; and feathers, 0.25.

72-0200. Wolfe, C. W.; Baxter, W. L.; Munson, J. D. (Res. Div., Game and Parks Commission, Nebraska). **Effects of parathion on young pheasants.** *Quart. Neb. Arg. Exp. Sta. 18(2): 4-6; 1971.*

The effects of parathion on young pheasants was investigated in a 15-day study. Sixty 9-week-old birds were contained in each of two 5-acre enclosures constructed in sorghum fields. One enclosure was aerially sprayed with parathion. The insect population in the treated area declined 88% by day 7. A natural decline of 53% was observed in the control area. Insects made up 50% of the crop content of pheasants in the treated area for up to 12 hr after the parathion spraying. Thereafter, insects constituted less than 5% of the diet. The crops of control birds consistently contained 2 to 7% of insects throughout the test. Slightly more than 88% of the applied parathion reached the 'pheasant level' or an area of 12 inches above ground. No dead birds were found and no toxic effects were observed. Plasma cholinesterase (ChE) was depressed 46% 12 hr after the parathion application. It rose to 68% of normal at 24 hr and then fell to 59%. It remained in the mid-50% range until the conclusion of the experiments. Brain AChE reached its lowest level at 24 and 48 hr. By 144 and 360 hr, the levels returned to 82 and 84% of normal, respectively. Neither blood nor brain cholinesterase returned to normal after a 15-day period, indicating that re-exposure to parathion within this period could kill young birds.

72-0201. Edwards, C. A. (Dept. of Entomology, Rothamsted Exptl. Station, Harpenden, Hertsfordshire, England). **Effects**

of herbicides on the soil fauna. *Proc. Brit. Weed Contr. Conf. 10th 3: 1052-7; 1970.* (17 references)

Herbicides may affect populations of soil invertebrates either directly or indirectly when the chemical affects the vegetation on which many of these animals feed. The direct effects of DNOC, MCPA, 2,4-D, 2,4,5-T, TCA, dalapon, monuron, linuron, triallate, simazine, atrazine and paraquat have been studied to date and the only herbicides that had effects on the numbers of soil invertebrates were DNOC, TCA, monuron, simazine and Shell WL 19805. The direct effect of the herbicides were never severe and with TCA and monuron, they occurred only after very large doses were applied to the soil. Three recent experiments with simazine, Shell WL 19805 and paraquat are described. Simazine and Shell WL 19805 slightly decreased the numbers of enchytraeid worms, predatory mites and isotomid worm. Paraquat had little effect on invertebrate populations. It seems that the only herbicides likely to influence numbers of soil invertebrates directly are DNOC and the triazines. None of these effects would adversely affect soil fertility. (Author abstract)

72-0202. Kuzminskaya, V. A. (Author address not given). **Mitochondria contractility under the effect of DDT and sevin [sic].** *Russ. Pharmacol. Toxicol. 34(2): 105; 1971.*

English translation; for an abstract of the original Russian article see 71-1935.

72-0203. Tikhonova, G. P. (Author address not given). **Continuous and intermittent action of methylmercaptophos on the microstructure of the animal organs [sic].** *Russ. Pharmacol. Toxicol. 34(2): 105; 1971.*

English translation; for an abstract of the original Russian article see 71-1936.

72-0204. Aristenko, V. G. (Roetgenology and Radiology Faculty, Aktyubin [sic] Medical Inst., Aktyubinsk, USSR). **Histomorphological changes in the bone tissue in chronic intoxication with sodium fluoride.** *Russ. Pharmacol. Toxicol. 34(2): 96-8; 1971.* (4 references)

English translation; for an abstract of the original Russian article see 71-1937.

72-0205. Gaur, A. C.; Misra, K. C. (Div. of Microbiology, I.A.R.I., New Delhi-12, India). **Effects of insecticides on soil micro-organisms.** *Pesticides 4: 24-7; 1970.* (22 references)

The effects of DDT and Sevin on populations of bacteria, actinomycetes, fungi and *Azotobacter* in all alluvial soil were investigated. The soil samples were incubated up to 60 days with various concentrations of the pesticides before microbial analyses were made. Normal field doses (1 ppm) of both compounds did not adversely affect any microbial population. Higher doses (100,1000 and 5000 ppm) reduced the bacterial population at various intervals. Actinomycetes were markedly reduced by Sevin during the entire incubation, but DDT was toxic only on the first day. The highest dose of Sevin (5000 ppm) mildly affected the fungal population, whereas 12 and 50 ppm of DDT were hazardous in the early days of incubation. *Azotobacter* was adversely affected by Sevin of the first day of incubation. DDT at 100 and 1000 ppm had a stimulatory effect on *Azotobacter* on days 20 and 60 of incubation. Sevin at 1000 and 5000 ppm reduced the nitrogen fixation by *Azotobacter chrococcum.* In general, the addition of organic matter to the soil reduced the deleterious effects of the pesticides.

72-0206. Longcore, J. R.; Samson, F. B.; Kreitzer, J. F.; Spann, J. W. (Patuxent Wildlife Res. Center, Laurel, MD 20670). **Changes in mineral composition of eggshells from black ducks and mallards fed DDE in the diet.** *Bull. Environ. Contam. Toxicol. 6(4): 345-50; 1971.* (18 references)

Black ducks and mallards were maintained on diets containing *p,p'*-DDE for several months before they began laying. The black duck diets contained 10 or 30 ppm of DDE, while the mallard diets contained 1, 5 or 10 ppm. The shells of 37 black duck eggs and 33 mallard eggs were analyzed for minerals by direct-reading emission spectroscopy. The eggshells from DDE-treated black ducks contained significantly higher amounts of magnesium and lower amounts of strontium and barium than were found in control eggshells. The calcium content was lower and the sodium and copper contents were higher, but the difference between the DDE-treatment and control values only approached significance. Increased magnesium and decreased aluminum were significant changes in the mallard eggshells from the 5 and 10 ppm treatment groups. At the 10-ppm level, calcium levels were significantly lower and an increase in sodium content approached significance. Correlation coefficients were determined for eggshell thickness and shell minerals among the eggshells from black ducks. The only significant correlation occurred in the control group, where higher levels of magnesium and sodium were associated with thinner shells.

See also 72-0003 72-0007 72-0019 72-0026 72-0027 72-0031 72-0035 72-0042 72-0045 72-0046 72-0053 72-0055 72-0056 72-0059 72-0063 72-0064 72-0071 72-0085 72-0230

72-0207. Rosales, J.; Dousse, R.; Becker, A. (CIBA-Geigy AG, Werk Monthey, [USA] Basel, Switzerland). **Kolorimetrische Bestimmungsmethoden fuer die Vinlyphosphatinsektizide Dicrotophos (Dimethyl-(2-dimethlycarbamoyl-1-methyl-vinyl)-phosphat) und Monocrotophos (Dimethly-(2-methylcarbamoyl-1-methyl-vinyl)-phosphat). [Colorimetric methods of determination for the vinyl phosphate insecticides dicrotophos (dimethyl-(2-dimethlycarbamoyl-1-methylvinyl) phosphate) and monocrotophos (dimethyl-(2-methlycarbamoyl-1-methyl-vinyl) phosphate).]** *Anal. Chim. Acta 56(1): 127-35; 1971.* (5 references) (German)

Two colorimetric assay methods for the vinyl phosphate insecticides dicrotophos and monocrotophos in technical concentrates or in formulations are described. They are based on the alkaline hydrolysis of the esters and the subsequent colorimetry of the resulting N-alkylacetoacetamides. In the first method, an iron(III) complex is formed with the enol form of these acetoacetamides. In the second, the hydrolysis products are made to react with a diazotized aromatic amine to give a colored hydrazone. (Journal abstract by permission)

72-0208. Ikramov, L. T.; Tashpulatov, A. Yu. (Dept. of Toxicological Chemistry, Tashkent Pharmaceutical Inst., Tashkent, USSR). **Khromatograficheskaya ochistka metilmerkaptofosa pri issledovanii biologicheskogo materiala. [Chromatographic cleanup of methyl mercaptophos in the study of biological material.]** *Sudebno-Med. Ekspertiza 13(4): 36-9; 1970.* (Russian)

A method is presented for the chromatographic cleanup of methyl mercaptophos from ballast substances which are extracted by chloroform from biological material. The suitability of qualitative methyl mercaptophos reactions in relation to the eluates obtained by paper and thin-layer chromatography has been experimentally demonstrated. The best chromatographic eluant is ethyl alcohol. The method was tested on artificial mixtures of methyl mercaptophos with a biological object (liver). (Author abstract translated and edited)

72-0209. Dicks, J. S. (Glasshouse Crops Res. Inst., Littlehampton, Sussex, England). **Determination of aminozide residues in chrysanthemum tissues.** *Pesticide Sci. 2(4): 176-8; 1971.* (4 references)

A method initially developed for aminozide (succinic acid mono(2,2-dimethylhydrazide)) determination in apple fruit, involving hydrolysis to unsymmetrical dimethylhydrazine and oxidation of the latter to form aldehyde, has been adapted for use with chrysanthemum tissues. The modifications include preparation of the standard curve from aminozide samples taken through the entire procedure, use of a smaller sample size, routine concentration of distillates containing unsymmetrical dimethylhydrazine on a rotary evaporator to remove interfering volatile material and correction for low levels of apparent aminozide found in untreated tissue. (Author abstract by permission)

72-0210. Miyamoto, J.; Nagamine, A.; Oka, Y. (Res. Dept., Pesticide Div., Sumitomo Chemical Co., Ltd., Osaka, Japan). **Microdetermination of residual amounts of fungicide Conen in rice grains.** *Noyaku Seisan Gijutsu 21: 9-12; 1970.* (Japanese)

Residual amounts of Conen (S-benzyl O-*n*-butyl S-ethyl phosphorodithiolate) in harvested rice grains were determined by gas chromatography using a potassium bromide thermionic detector. The content was mostly in the range of 0.05 to 0.005 ppm. It was larger when the interval between the last application and harvest was shorter and when the spraying was repeated. The emulsion had a tendency to give larger residues than the dust formulation. The residual amount of Conen in rice grains was found to be far below the maximum permissible concentration (0.38 ppm) calculated from the results of a 90-day feeding test with white rates. (Journal abstract edited)

72-0211. Takase, I.; Tsuda, H.; Nakamura, S.; Kuyama, S. (Author address not given). **The gas chromatographic determination of pesticides. 3. Determination of residues of organophosphorus pesticides.** *Noyaku Seisan Gijutsu 22: 13-21; 1970.* (Japanese)

Residues of Baycid (fenthion), Disyston (disulfoton) and their metabolites were analyzed. Extracts were separated by thin-layer or liquid chromatography. Aliquots of the concentrated fractions were injected into a gas chromatograph with a flame photometric detector or alkali flame thermionic detector sensitive to phosphorus. In one method, Baycid, Disyston and their metabolites were converted to the corresponding sulfones, using potassium permanganate as the oxidant. Recovery experiments were run on rice grain or onion by adding 0.1 to 0.2 ppm of Baycid or its metabolites at the extraction step. In general, recoveries were in the 94 plus/minus 10% range. Recoveries by the specific method were 95 plus/minus 1%. Sensitivity was 0.005 ppm or better. A flame photometric detector, highly specific for phosphorus and sulfur containing compounds, was useful for the analysis of Hinosan (Bayer 78418) and its metabolites. (Journal abstract edited)

72-0212. Kubo, M.; Yokawa, Y.; Yanase, R.; Kosasa, S.; Shimizu, H.; Yakazaki, I. (Author address not given). **Determination of active ingredient in Topsin and its formulations.** *Noyaku Seisan Gijutsu 22: 35-9; 1970.* (5 references) (Japanese)

An analytical method was developed to determine Topsin (diethyl-4,4'-*o*-phenylene-3,3'-dithiodiallophanate) in Topsin technical and its wettable powder. The sample was dissolved in ethyl acetate, percolated through an active alumina and washed with nitric acid, followed by water. The column was eluted with ethyl acetate:*n*-hexane:methanol (35:64:1). The absorbancy of the eluate was measured at 269 m*mu*, using a 23.9 ppm solution in methanol of phenanthrene as the stable reference solution. The accuracy of the measure-

ment of Topsin and its wettable powder was 0.16 and 0.12%, respectively, in terms of standard deviation. (Journal abstract edited)

72-0213. Wakimoto, T.; Tatsukawa, R.; Ogawa, T. (Dept. of Agriculture, Ehime U., Matsuyama, Japan). **Air pollution by pesticides. 2. Air pollution by BHC.** *Taiki Osen Kenkyu 5(1): 92; 1970.* (Japanese)

A method was developed to analyze organic pesticides such as BHC directly from the air and used to conduct a survey around Matsuyama City, Japan. An absorbing agent was packed in a glass sampling tube which was attached to a small pump. After a fixed amount of time allowed for adsorption, the inside of the tube was washed out with 50 ml of acetone. The washings were then mixed with 400 to 500 ml of a hexane-distilled water solution. The supernatant of the hexane portion was directly analyzed by gas chromatography. With 24 hr of exposure, the recovery rate of BHC, dieldrin and *p,p'*-DDT was 98 to 100%. The apparatus is small, light and easy to prepare in quantity. The absorbing agent dries in 2 to 3 hr at a temperature of 100 C. The survey of the Matsuyama area proved that BHC existed in every sample collected though in varied quantity. Samples from rice fields before the spraying season contained 1.127 mcg/cu m, whereas in the urban area in the same season they yielded 0.054 mcg/cu m of BHC. The direct effects of spraying disappeared in a day and the residual pollutants were considered to be the result of evaporation form the rice paddies and plant sufaces. Therefore, the test results were highly influenced by spraying schedules and atmospheric conditions such as temperature and humidity.

72-0214. Kotakemori, M.; Yamaoka, K.; Obayashi, K. (Yasugawa Plants, Sankyo Co., Ltd., Yasugawa, Japan). **Infrared spectrophotometeric determination of MPMC and MTMC in dust formulations.** *Noyaku Seisan Gijutsu 22: 9-12; 1970.* (15 references) (Japanese)

A method has been developed for the rapid infrared spectrophotometric determination of MPMC (3,4-xylyl N-methylcarbamate) and MTMC (*m*-tolyl N-methylcarbamate; Tsumacide) in dust formulations with one or more insecticidal active ingredients. MPMC, or MTMC, was extracted from the dust preparations with chloroform and was determined by measuring absorbances at 1740/cm or 1735/cm. The time required for analysis was about 30 min and reasonable results were obtained with recovery tests. The analytical data obtained by this method were in good agreement with those obtained by the thin-layer chromatographic procedure. The variation coefficient was about 0.5% for both MPMC and MTMC dust formulations. (Journal abstract edited).

72-0215. Coutselinis, A.; Dimopoulos, G. (Dept. of Forensic Medicine and Toxicology, U. of Athens School of Medicine, 48 Academy Ave., Athens 143, Greece) **Organophosphorus pesticides in liver: Their identification by gas-liquid chromatography (GLC).** *J. Forensic Med. 18(1): 11-4; 1971.* (30 references)

Organophosphorous pesticides were determined in liver by a combination of thin-layer chromatography (TLC) and gas-liquid chromatography (GLC). The liver of a rat poisoned with parathion, malathion, Phosdrin (mevinphos), Rogor (dimethoate), Meta-Systox (demeton methyl), and Gusathion (azinphos-methyl) was extracted by homogenization with 7.5 g in 45 ml acetone for 5 min followed by filtration. The acetone solution was then homogenized for another 5 min, filtered and 30 ml of a 4.5% barium sulfate octahydrate solution and 30 ml of 5% zinc sulfate were added. After filtration, the filtrate was extracted with 80 ml ether which was then concentrated and dissolved in 1 ml acetone. Neutral silica gel G plates (0.2 mm thick) prepared according to Stahl (1969) were activated at 120 C for 1 hr and developed in n-hexane: acetone:ether 55:35:10. After drying at room temperature, the plates were sprayed with 0.5% palladium chloride (slightly acidified with hydrochloric acid) and 0.5% potassium permanganate to visualize the compounds. A sample for GLC was obtained by elution of an unsprayed area with 5 ml acetone. A FM-700 gas chromatograph was used, equipped with an electron-capture detector, utilizing a 4 ft x 1/4 in i.d. glass column packed with 5% silicone on 80-100 mesh Diatoport S. Argon-10% methane was used as the carrier gas at a flow rate of 60 ml/min. The operating temperatures for the column, detector, and injection port were 180 C, 200 C, and 240 C, respectively. While GLC can be performed immediately after extraction, the TLC is preferred because it cleans up the sample and its retention factor assist in the determination of the pesticide involved. The retention times of the pesticides are given and a typical chromatogram is reproduced.

72-0216. Erwin, D. C.; Sims, J. J.; Borum, D. W.; Childers, J. R. (Dept. of Plant Pathology, U. of California, Riverside, CA 92502). **Detection of the system fungicide, thiabendazole, in cottonplants and soil by chemical analysis and bioassay.** *Phytopathology 61(8): 964-7; 1971.* (7 references)

Chemical and biological methods of detecting thiabendazole (TBZ) in cotton plants and soil were compared in laboratory experiments. The bioassay involved placing a plant part on an agar plate for 24 hr and then spraying the plate with *Verticillium albo-atrum.* The presence of TBA was indicated by the inhibition of fungal growth. TBZ could be detected in roots, stems and leaves by spectrophotofluorometry after ethyl acetate extraction confirmed that the fungitoxic substance in the plants was TBZ and that the greatest concentration was in the roots and lower stems. Estimated 77% recoveries of TBZ from treated soils were obtained by both chemical and biological methods. In the chemical method, TBZ was extracted from soil samples with hot methanol. After purification, the extracts were analyzed by ultraviolet spectrophotometry. The bioassay with *V. albo-atrum* was carried out with crude methanol extracts dissolved in dimethylsulfoxide.

72-0217. Berry, D. J.; Grove, J. (Poisons Unit, New Cross Hospital, London S.E. 14, England). **The determination of paraquat (1,1'-dimethyl-4,4'-bipyridylium cation) in urine.** *Clin. Chim. Acta 34(1): 5-11, 1971.* (10 references)

A spot test an an ion-exchange chromatographic method

for clinical use in determining paraquat in human urine are described. The spot test involves adding 2 ml of 1% sodium dithionite in 1 N sodium hydroxide to 10 ml urine. Visual inspection for the characteristic blue color of the free radical is then made. With this method, 1.0 mcg ion/ml clear urine and 1.5 mcg ion/ml cloudy urine could be reliably detected. It is concluded that a positive reaction to the spot test indicates that sufficient paraquat has been absorbed by a patient to warrant hospitalization and careful observation for at least 10 days. The ion-exchange columns consisted of 50-ml burettes plugged with glass wool and containing 3 g of Dowex AG50W-X8 (50 to 100 mesh). The urine sample was passed through the columns at a rate not greater than 5 ml/min. The column was then washed successively with 100 ml distilled water, 100 ml N hydrochloric acid, 50 ml distilled water, 100 ml 2.5% ammonium chloride and 100 ml distilled water. The resin was finally eluted with saturated ammonium chloride solution at a rate not greater than 1 ml/min. The first 50 ml of eluate were collected in a volumetric flask. Standard solutions of paraquat dichloride in saturated ammonium chloride solution were made (0.25, 0.5, 0.75 and 1.0 mcg paraquat ion/ml) and 10 ml of each standard was pipetted into 19-ml glass-stopped tubes. Ten ml of saturated ammonium chloride solution (for use as a reference) and 10 ml of each eluate were pipetted into similar tubes. Two ml of sodium dithionite reducing solution (1% sodium dithionite in 1 N sodium hydroxide) were added to each tube. Absorbance was measured within 5 min at 396 nm and a calibration graph of absorbance against concentration was prepared. The equations for calculating for paraquat ion concentration in the sample are given. As little as 0.01 mcg ion/ml in a 250-ml aliquot of urine could be detected with this method. Urine analyses for five patients are given. These showed that the excretion of paraquat was still going on 3 weeks after ingestion. It was not possible to correlate paraquat levels in the urine with the severity of poisoning. Evidence in one case suggested that there is a relation between the weight of paraquat excreted and the volume of urine voided. It is on this basis that immediate induction of diuresis following paraquat ingestion is recommended.

72-0218. Zitko, V. (Biological Station, Fisheries Res. Board of Canada, St. Andrews, New Brunswick, Canada). **Effects of pesticide-grade hexanes on the silicic acid chromatography of polychlorinated biphenyls and organochlorine pesticides.** *J. Chromatog. 59(2): 444-5; 1971* (4 references)

The effect of two commercial pesticide-grade hexanes (Fisher scientific Company and Matheson Coleman & Bell) on the elution patterns of polychlorinated biphenyls (PCBs) and organochlorine pesticides from silicic acid (Silicar) columns was determined. The test mixture contained (in nanograms) 6.9 hexachlorobenzene, 46.5 lindane, 46.5 heptachlor, 48.0 aldrin, 90.6 heptachlor epoxide, 121.0 *p,p'*-DDE, 64.8 dieldrin, 136.0 *p,p'*-DDD, 136.0 *p,p'*-DDT and 689 Aroclor 1254. Both commercial hexanes produced benezene absorption peaks at 259, 253.5 and 247.5 nm. Absorption increased sharply to values greater than 1 at shorter wavelengths in the Fisher hexane, while a benzene peak at 242 nm was observed in the Matheson hexane. Based on the absorption at 259 nm, the Fisher hexane contained 0.79 ml of benzene/l and the Matheson hexane contained 0.21 ml/l. The Fisher hexane eluted 56% of the Aroclor 1254 in fraction 1 and 100% of *p,p'*-DDE in fraction 2, whereas the Matheson hexane eluted 18% of the Aroclor and 56% of the *p,p'*-DEE. Thus, it is necessary to give detailed characteristics of any commercial hexane used in the chromatography of PCBs and organochlorine pesticides on silicic acid and possibly on other absorbents as well.

72-0219. Sissons, D.; Welti, D. (Unilever Res. Lab., Colworth House, Sharnbrook, Bedford, England). **Structural identification of polychlorinated biphenyls in commercial mixtures by gas-liquid chromatography, nuclear magnetic resonance and mass spectrometry.** *J. Chromatog. 60(1): 15-32; 1971.* (24 references)

The major constituent polychlorinated biphenyls in Aroclor 1254 have been characterized by high resolution nuclear magnetic resonance and mass spectrometry following separation by liquid-solid and gas-liquid chromatography. The retention indices of these compounds together with those of forty synthesized polychlorinated biphenyls have been used to predict the structures of the remaining Aroclor 1254 constituents, together with all those of Aroclor 1242 and 1260. (Journal abstract by permission)

72-0220. Bevenue, A.; Ogata, J. N.; Kawano, Y.; Hylin, J. W. (Dept. of Agricultural Biochemistry, U. of Hawaii, Honolulu, HI 96822). **Potential problems with the use of distilled water in pesticide residue analyses.** *J. Chromatog. 60(1): 45-50; 1971.* (1 reference)

Precautions should be taken with distilled water that may be included in any scheme of analysis for pesticides, especially in the nanogram-picogram analytical range, to insure that the water has not been contaminated with organic components derived from the water distillation system. Ultimate analysis of the sample by gas chromatography, utilizing an electron-capture detector, will record any contaminants present and they may confuse the interpretation of the pesticide analytical data. Preferably, an all-glass still unit which contains no plastic fittings of any type should be used. Some of the potential problems with distilled water that may occur if plastic or resin components are included in the distillation system are discussed in this report. (Journal abstrat by permission)

72-0221. (Institut fuer Pharmakologie aund Toxikologie, Universitaet Goettingen, Geiststrasse 9, 24 Goettingen, Germany). **Bestimmung der molaren Konzentration von Acetylcholinesterase durch Phosphorylierung mit Paraoxon oder Soman. [Determination of the molar concentration of acetylcholinesterase based on phosphorylation by paraoxon or soman.]** *Biochim. Biophys. Acta 242(2): 371-80; 1971.* (15 references) (German)

The paper describes the determination of the molar con-

centration of the active sites of acetylcholinesterase (acetylcholine hydrolase EC 3.1.1.7). The kinetic measurement uses phosphorylation by paraoxon or soman. The graphic evaluation is based on the kinetic equations for second-order reactions with an equimolar concentration of the reactants. The determination can be done easily and quickly. During phosphorylation, only measurement of diminishing acetylcholinesterase activity is necessary. Radioactive labeling and dialysis are not needed. The method is suitable for the determination of very low acetylcholinesterase concentrations. Using paraoxon enzyme, concentrations to about 10 nm and using soman enzyme, concentrations to about 0.2 nm can be determined. (Journal abstract by permission)

72-0222. Rey, A.; Hanss, M. (Section de Biophysique, Centre de Recherches, Service de Sante des Armees, 108, Boulevard Pinel, Lyon, 3eme, 69, France). **Determination rapide de l'activite cholinesterasique du serum par une ultramicromethode conductimetrique. [Rapid ultramicro determination of serum cholinesterase activity by a conductimetric technique.]** *Clin. Chim. Acta 30(1): 207-14; 1970.* (26 references) (French)

The conductivity increase which appears during the enzymatic hydrolysis of acetylcholine is used to measure the serum cholinesterase activity. A description of the method is given; the measurement is simple and takes only a few minutes; between 20 and 40 mcl of serum are necessary. The results are similar to those obtained by the Ellmann method (1961). Unlike colorimetric techniques, the precision and sensitivity of the conductometric determination are unaffected by the color or turbidity of the samples. (Author abstract)

72-0223. Pomonis, J. G.; Severson, R. F.; Hermes, P. A.; Zaylskie, R. G.; Terranova, A.C. (Metabolism and Radiation Res. Lab., Agricultural Res. Ser., U.S. Dept. of Agriculture, Fargo, ND 58102). **Analysis of insect chemosterilants: Action of phosphate buffers on azirdine.** *Anal. Chem. 43(12): 1709-12; 1971.* (14 references)

The influence of pH and phosphate buffer concentration on the hydrolysis of aziridine was investigated by a modification of the standard colorimetric assay method of Rosenblatt *et al.* (1955), which was found suitable for the collection of kinetic data. The rate of aziridine disappearance in 0.5 M phosphate buffers at 27 C was determined at pH 6, 7 and 8 over 440 min. The rate of disappearance increased as the pH decreased. The influence of phosphate concentration on aziridine hydrolysis was determined over 400 min at 27 C in pH 7 solutions containing 0.05, 0.10, 0.15, 0.20 and 0.25 M concentrations of the buffer. The disappearance rate increased with an increased molar concentration of the phosphate buffer. In both determinations, small decreases in pH occurred during hydrolysis. Equations describing the hydrolysis of aziridine are given.

72-0224. Nakada, Y.; Yura, Y.; Murayama, K. (Central Res. Lab., Sankyo Co., Ltd., Hiromachi, Shinagawa-ku, Tokyo, Japan). **Pyrolysis of allethrin.** *Bull. Chem. Soc. Japan 44(6): 1724; 1971.* (3 references)

Five pyrolysis products of allethrin were identified. Pyrolysis was carried out in a glass tube at 400 C under nitrogen. The products were 2,6-dimethylhepta-2,4-diene, pyrocin, chrysanthemic acid, 2,7-diallyl-3,6-dimethyl-1-indanone and 2,4-diallyl-3,5-dimethyl-1-indanone. A typical gas chromatograph of the reaction products is reproduced and the postulated reaction mechanism is given with structural formulas.

72-0225. McKinney, J. D.; Keith, L. H.; Alford, A.; Fletcher, C. E. (National Inst. of Environmental Health Sciences, National Inst. of Health, Public Health Ser., Dept. of Health, Education and Welfare, Research Triangle Park, NC 27709). **The proton magnetic resonance spectra of some chlorinated polycyclodiene pesticide metabolites. Rapid assessment of stereochemistry.** *Can. J. Chem. 49(12): 1993-2003; 1971.* (27 references)

Proton magnetic resonance (PMR) spectra were obtained for *trans*-4,5-dihydroxy-4,5-dihydroaldrin, *cis-exo*-4,5-dihydroxy-4,5-dihydroaldrin, 4-oxo-4,5-dihydroaldrin, *endo*-4-hydroxy-4,5-dihydroaldrin, *cis-exo*-4,5-dihydroxy-4,5-dihydroisodrin and *delta*-keto endrin. The nuclear magnetic resonance shift reagent *tris*(dipivalomethanato) europium, which effected the separation of superimposed signals, was used in making proton assignments. The results obtained with this reagent were in good agreement with assignments based on coupling constants. The structural information obtained from the spectra allowed the rapid and accurate determination of the relative stereochemistry of the compounds. The chemical shifts and coupling constants for the compounds are given in tables and eight spectra are reproduced.

72-0226. Kroeller, E. (Abteilung Lebensmittelchemie, Max von Pettenkofer-Institut, Bundesgesundheitsamt, Unter den Eichern 82/84, 1 Berlin 45, Germany). **Untersuchungen zur Restmengenbestimmung von Chlorpikrin in Getreide. [Studies on chloropicrin residue quantitation in grains.]** *Deut. Lebensm.-Rundschau 67(5): 150-2; 1971.* (9 references) (German)

In the protection of stored goods, especially outside of Germany, chloropicrin is used aginst granary weevils. At the present time in the Federal Republic of Germany, no tolerance value has been established for this pesticide in grains. For chemical foodstuff control, therefore, a sensitive and specific procedure for its determination has been developed. After evaporation in a nitrogen stream and collection in *n*-hexane, the chloropicrin is reacted with sodium isopropylate. This reaction yields, among other things, sodium nitrite. The latter is determined spectrophotometrically as a color complex with guaiazulene nitroaniline reagent. The limit of detection of this method reaches 0.01 ppm. Pilot tests with different rice varieties and barley have shown that chloropicrin reacts with the ingredients present–presumably proteins. Nothing is known at present about the type of resulting metabolities. (Author abstract translated)

72-0227. Chu, J. P.; Kirsch, E. J.; Born, G. S. (School of Civil Engineering, Inst. for Environmental Health Studies, Purdue U., Lafayette, IN 47907). **Thin-layer chromatography of *n*-dodecylguanidines.** *Bull. Environ. Contam. Toxicol. 6(4): 343-4; 1971.* (2 references)

Thin-layer chromatographic (TLC) procedures for the separation and detection of *n*-dodecylguanidines in environmental water samples are described. The steps in the procedure are as follows: prepare a standard solution of *n*-dodecylguanidine acetate (DGA) in acidified methanol equivalent to 1 mcg of *n*-dodecylguanidine/mcl. Take four 200-ml aliquots of a water sample; spike three with the standard DGA solution to yield final concentrations of 0.5, 2.0 and 5.0 mg/1. Evaporate samples to dryness at 45 C under a vacuum. Extract residues in each sample with three portions (4, 2 and 2 ml) of methanol. Combine these extracts and evaporate to dryness with cotton-filtered air. Reconstitute to 1 ml. Apply 10 mcl of each sample to a TLC plate along with aliquots of the standard DGA solution. The TLC plates used in developing the procedure were coated with 0.25 mm of Absorbasil-1 and were activated for 1 hr at 100 C before use. Two chromatographic solvent systems gave good separation of DGA from other constituents of the sample: *n*-butanol, acetic acid and water at a ratio of 8:1:1 or 7:1:2. The minimum level of detection with this procedure was 1 mcg of *n*-dodecylguanidine in a sample applied to the TLC plate.

72-0228. Fusi, P.; Mazzoni, S.; Antonelli, C. (Istituto di Chimica Agraria e Forestale, Universita di Firenze, Florence, Italy). **Indagini preliminari per l'accertamento nel terreno di residui di trifluralin e per la loro interpretazione agronomica. [Preliminary studies on estimating trifluralin residues in soil and on their agronomic interpretation.]** *Notiz. Mal. Piante No. 82-3: 105-15; 1970.* (1 reference) (Italian)

The persistence of trifluralin in soil was studied by determining its residues chemically and biologically for the purpose of finding a parallelism in the results which would permit agronomic calibration of the chemical method of analysis. The results obtained indicated the possibility of establishing, in a trifluralin-treated soil, a crop sensitive or very sensitive to the herbicide when the soil residues, determined chemically, are less than 0.05 ppm. When the residues are on the order of 0.05 ppm or less, the possibility exists of planting a crop that is tolerant or less sensitive to trifluralin. (Author abstract translated)

72-0229. Rote, J. W.; Murphy, P. G. (Hopkins Marine Station, Stanford U., Pacific Grove, CA 93950). **A method for the quantitation of polychlorinated biphenyl (PCB) isomers.** *Bull. Environ. Contam. Toxicol. 6(4): 377-84; 1971.* (19 references)

An electron-capture gas chromatographic procedure for the quantitation of individual polychlorinated biphenyl (PCB) isomers in tissue samples is described. The method is based on the principle that detector response depends upon the degree of PCB chlorination. Chromatograms were obtained for Aroclor 1232, 1242, 1248, 1254, 1260 and 1262. These revealed 32 different PCB isomers. The chlorine content (mono through deca) represented by the individual peaks was identified by published mass spectrometric data. The amount of various chlorinated components in an Aroclor compound was determined by combining all peaks that corresponded to monochlorobiphenyls, to dichlorobiphenyls, etc. The least-squares method was used to determine the semilogarithmic relationship of detector response to the average chlorine content of each Aroclor. The theoretical response of the detector to each chlorinated biphenyl (mono through deca) was calculated from this relationship (detector response curve). These values were then used to calculate the amount of chlorinated biphenyl represented by each peak and to determine the amount of each chlorinated component in the PCB standards. The distribution of the chlorinated components in the Aroclor compounds and the quantitation of PCB components in a tissue sample are given in tables. A chromatogram of Aroclor 1260 is reproduced along with a chromatogram of a tissue sample.

72-0230. Coppage, D. L. (Gulf Breeze Lab., Pesticide Office, Environmental Protection Agency, Sabine Island, Gulf Breeze, FL 32561). **Characterization of fish brain acetylcholinesterase with an automated pH stat for inhibition studies.** *Bull. Environ. Contam. Toxicol. 6(4): 304-10; 1971.* (7 references)

A method for measuring normal and organophosphate-inhibited fish brain acetylcholinesterase (AChE) with a recording pH stat is described. In developing the method, homogenated brains from sheepshead minnows *(Cyprinodon variegatus)* were used to study the function of enzyme and choline ester concentration, the action of enzymes on specific choline esters and the effects of pH and temperature on AChE activity in assay mixtures. The steps in the procedure are as follows: pool 5 to 10 brains from fish of similar size; weigh and homogenize them in distilled water and dilute with distilled water to 5 mg tissue/ml. Mix 2 ml of homogenate with 2 ml of 0.03 M acetylcholine iodide (ACh) in distilled water. Titrate the liberated acetic acid with carbonate-free, 0.01 N sodium hydroxide. Carry out the reaction at pH 7 and 22 C, while passing nitrogen over the liquid to prevent the adsorption of atmospheric carbon dioxide. Calculate the micromoles of ACh hydrolyzed/unit of time from the micromoles of the sodium hydroxide required to neutralize the liberated acetic acid/unit of time. Express the AchE activity as mcM of ACh hydrolyzed/hr/mg of brain tissue. Fish brain samples should be taken periodically for 12 months to establish the mean normal AChE activity and the standard deviation. The inhibition of brain AChE achieved *in vitro* with 0.0001 M concentrations of Guthion (azinphos-methyl), phorate, parathion and diazinon showed that the assay method can detect the presence of organophosphate pesticides. Comparison of the percentage inhibition with the 48-hr LD50s of the compounds showed that *in vitro* inhibition of AChE was not closely related to the toxicities of the compounds: Guthion–59.3% and 3.5 mcg/1 of aquarium water; phorate–31.5% and 9.0 mcg/1; parathion–27.8% and 100.0 mcg/1; and diazinon–100.0% and 100.0 mcg/l. Only *in vivo* inhibition can therefore be a meaningful indicator of toxicity and this determination first requires laboratory bioassays to measure the relation of

Analysis

AChE inhibition to pesticide concentration, length of exposure and death. The advantages of the pH stat over other AChE assay methods are discussed.

See also **72-0030** **72-0035** **72-0039** **72-0053** **72-0069** **72-0138** **72-0173**

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